SERIES 3—Vol. 5, No. 4 APRIL, 1922

AMERICAN JOURNAL OF OPHTHALMOLOGY

Incorporating Established by

THE AMERICAN JOURNAL OF OPHTHALMOLOGY.....Adolph Alt 1884
THE OPHTHALMIC RECORD.....Giles C. Savage 1891
ANNALS OF OPHTHALMOLOGY.....James Pleasant Parker 1892
ANALES DE OFTALMOLOGIA.....M. Uribe-Troncoso 1898
OPHTHALMOLOGY.....Harry Vanderbilt Würdemann 1904
OPHTHALMIC YEAR BOOK AND LITERATURE.....Edward Jackson 1904-11

Annual Subscription Ten Dollars in Advance,
Single Copies One Dollar.

PUBLISHED MONTHLY BY THE OPHTHALMIC PUBLISHING COMPANY
7 West Madison Street, Chicago, Illinois.

Entered as Second Class Matter January 1st, 1918, at the Post Office, Chicago, Ill., under the act of March 3rd, 1879.

PROLIFERATING CHORIO-RETINITIS OF RIGHT EYE, COVERING THE OPTIC DISK
(LAMB'S CASE)

AMERICAN JOURNAL OF OPHTHALMOLOGY

Vol. 5 APRIL, 1922 No. 4

TRANSVERSE GUNSHOT WOUND OF BOTH ORBITS RESULTING IN A PROLIFERATING CHORIORETINITIS IN ONE EYE.

H. D. LAMB, M.D.

ST. LOUIS, MISSOURI.

The case here reported illustrates the ultimate result in injuries of this class. The changes found within the eye may have resulted from injury to the scleral coat, but probably not from any direct injury to the retina and choroid, except such as is produced around the track of such a missile. Read before the St. Louis Ophthalmic Society, May, 1921. (See page 296.)

The subject of our study is an exceptionally bright boy of 12 years, who, when 8 years old, in August, 1916, was accidentally shot by his brother. This occurred, according to the boy's statement, from a distance of abuot 12 inches, with a 22 rifle, while hunting. The patient had stooped to pick up a cartridge from the ground and was straightening up when the gun went off. The bullet entered about 3/4 in. anterior and 3/4 in. above the lower end of the left ear, and passing to the right upwards and forwards, came to lie behind a dislodged piece of bone at the outer end of the right eyebrow. The bullet was extracted thru an incision in the skin; there is now a small opening in the bone felt at this point. Complete blindness of both eyes immediately followed the shot, and has remained permanently.

The admission to the Missouri School for the Blind occurred in September, 1917, at which time the appearances in the fundi were essentially as they are at present.

The ophthalmoscopic examination of the left eye reveals an optic nerve of greyish white color and clear cut outline; the cribiform plate openings extend over an enlarged area, while the retinal vessels are not markedly diminished in size. Undoubtedly the nerve has been severed behind the entrance of the central vessels, causing a descending atrophy.

The ophthalmoscopic examination of the right eye shows the central part of the fundus with the optic nerve and macula covered by a prominent and extensive sheet of a rather glistening greyish white scar tissue, having a faint bluish tinge. This sheet is of very irregular outline with one long extension projecting upward; in some places the margin is continued into narrow finger like processes. No blood vessels cross this tissue, altho in two places at its edge a small, rather tortuous artery emerges from beneath it, coils over its margin for a short distance and then resumes its way to the periphery. At the margins of this plaque, there occurs a rather marked accumulation of pigment, which is retinal in appearance. Surrounding this area is a moderately broad ring of marked retinochoroidal changes, consisting of many large and small accumulations of mostly retinal pigment, interspersed with many large and small greyish white areas. Choroidal vessels are plainly seen in several places. Beyond this ring the fundus is apparently normal in appearance.

The patient states that when he was shot he was looking down and to the right. In this position the posterior pole of each eye would be above and to the left, which would doubtless explain the injury to the maculopapillary region of the right eye. From the direction of the bullet's course, it is seen

to be quite likely that the projectile grazed or came very close to this part of the eyeball. It is not impossible that the optic nerve was forcibly drawn to the right side by the bullet or even partially avulsed. Such injuries could easily cause ruptures of the choroid and retina around the macula and optic nerve. Large amounts of resulting hemorrhage, with excessive subsequent cicatrization, covering the lacerations and filling up the excavation left by an avulsion of the nerve, would explain the ophthalmoscopic appearance of the right fundus.

Lagrange[1], in his recent Ophthalmoscopic Atlas of the War, states that all traumatic lesions of the inner membranes of the eye can be reduced to two types; lesions by concussion seated at the posterior pole and especially in the macular region, and lesions by contact produced at the spot where the missile grazes the eye. In addition lesions by concussion are choroidal ones, consisting of one or more lacerations of the choroid; whereas lesions by contact are chorioretinal ones, consisting of ruptures of the choroid and retina, which give rise to proliferating chorioretinitis.

As his 5th Law, Lagrange says that when the missile passes thru the orbit without striking the eyeball, it produces in it severe lesions by commotion, macular and paramacular disturbances. Adams[2] in his book entitled Ophthalmoscopic Diagnosis, says that in transverse shot wounds of the orbit the eyeball is pressed in from behind by the explosive force of the shot passing rapidly thru the orbit, and the choroid is thereby ruptured in many places.

Both Lagrange and Adam designate as proliferating chorioretinitis that condition which results in fundus appearances similar to those under consideration. Lagrange's explanation is that the choroid and retina are ruptured under the influence of a shock, or of ocular concussion, and a more or less extensive hemorrhagic extravasation arises in the meshes of these membranes and in the retinovitreous space. This hemorrhage is not absorbed readily; it becomes organized, irritating at the same time the connective tissues of the uveal tract at the level of the rupture. An excessive cicatrization thus results and leads to the picture of a prominent elevated greyish white mass with the retinal vessels passing over or under it. Surrounding this mass there may be a more or less extensive area, blackish and pigmented.

Lister[3] adds some particulars to chorioretinal ruptures. He states that glistening white spots are often seen ophthalmoscopically in the fundi of these cases for a short time following the injury. These gradually fade, and in the course of time their place is taken by plaques of fibrous scar tissue. It would appear likely, the author says, that these glistening white spots are patches of coagulation necrosis brought about by the rupture of retinal and choroidal vessels in the immediate neighborhood, thus cutting off the blood supply and nutrition of certain areas of the retina. The cause for the festooned outline of the cicatricial plaques, which occurs at one place with the large mass in our case, Lister says, is that the mass was larger at one time and roughly circular; it became attached at certain points to the retina where its structure was not completely disorganized, so that as contraction took place the outline became bayed between the fixed points. The same writer states that, combined and intermingled with ruptures and fibrous tissue plaques, occur areas of retinal and choroidal atrophy. Pigmentation is also commonly seen after the first few weeks; it may be either in irregular coarse patches, fine peppering or in bone corpuscle deposits.

De Schweinitz[4] has written a general review of concussion and contusion ocular injuries of the war, giving the salient points in the literature. This author says that lacerations of the choroid and retina depend in part upon stretching of these membranes by the vibrations in the vitreous. Such injuries are frequently located at the posterior pole of the eye and near the papilla, these situations being peculiarly liable,

probably because the sclera, thicker around the entrance of the optic nerve than elsewhere, does not readily stretch. Its resistance in this regard causes the effect of the force to be more potent on the tissue just in front of it.

Wagenmann[5], reviewing the literature of these cases, gives the microscopic findings in a number of eyes showing a proliferating chorioretinitis, which were enucleated and sectioned. He gives such a report by Cohn, where five months after a shot wound in the malar bone, there was found a connective tissue mass 1 to 1 1/2 cm. broad and 1 1/2 mm. thick, which extended from the papilla to the ora serrata, and into which the choroid and retina were merged. In place of the papilla, there appeared a whitish protuberance; the retina showed in the vicinity simple atrophy with pigment proliferation. Wagenmann quotes from the findings of Goldzieher in a case of transverse revolver shot wound of both orbits. Here there was found ophthalmoscopically eight months later in both eyes a large tumor like mass projecting into the vitreous. One eye, coming to enucleation on account of pain in it, showed histologically, besides pigment changes and fibrous atrophy of the retina, nodular proliferation which proceeded from the choroid, and in which some bony tissue had developed. Goldzieher considered this change the result of a plastic choroiditis.

Another case of transverse shot wound of both orbits reported by Nettleship is reviewed by Wagenmann. Thirty days after the injury, the patient died of meningitis. Microscopic examination showed in both eyes choroidal and retinal rupture with adhesion between these layers, extensive hemorrhages between the choroid and retina, as well as between the retina and vitreous, and a new formation of a connective tissue poor in cells. This connective tissue had filled the gap left by the rupture and inserted itself as a fibrillary sheet between the choroid and retina on the one hand, and between the retina and vitreous on the other.

I wish to express my indebtedness to Dr. J. W. Charles for his kindness in permitting me to report this case from his service at the Missouri School for the Blind.

BIBLIOGRAPHY

1. Lagrange. Ophthalmoscopic Atlas of the War, 1918.
2. Adam. Ophthalmoscopic Diagnosis, 1913.
3. Lister. War Injuries of the Eye, Lancet, 1918, *2*, page 67.
4. De Schweinitz. Concussion and Contusion Injuries of the Eye, American Journal of Ophthalmology, *2*, 1919, page 313.
5. Wagemann. Gunshot Wounds with Large Projectiles, Graefe-Saemisch, Handbuch der Augenheilk., *2* Auflage, 9 Band, 5 Abt., page 1837.

PTERYGIUM SURGERY.

MICHAEL GOLDENBURG, M.D.

CHICAGO, ILL.

Pterygium may be either stationary or progressive. Operations for it must be especially planned to control the latter form. Its location, histology and tendency indicates pterygium is distinct from pinguecula. The operation should include thoro removal of underlying tissue with a curet, dissection including all the growth undermined to the plica and the McReynolds transplantation, modified by carrying the head suture thru the lower lid, and tying it over a bit of rubber tubing. Read before the Chicago Ophthalmological Society, Nov. 21, 1921.

When we think of the removal of a pterygium, whether it be for the cosmetic effect to be attained or for the purpose of preventing interference with good vision, we must immediately think of the type of disease we are dealing with, for upon that is dependant the surgical procedure to be resorted to.

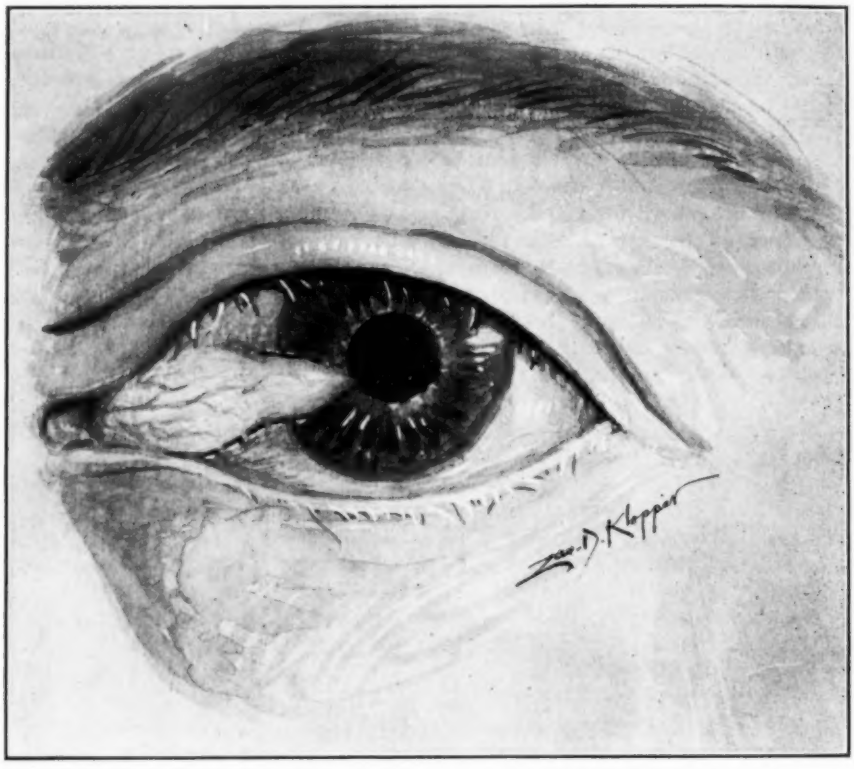

Fig. 1.—Pterygium Operation (Goldenberg). Broken line shows outline of incision.

The classification used by the older writers, which was largely influenced by the fancied resemblance of the pterygium to other conditions and referred to by such profound names as Pterygium Crassum, Vasculosum, Carnosum, Sarcomatosum, and Membranaceum, is now obsolete; and I believe rightfully so. This is probably due to the fact that we now have a better knowledge of this condition than we possessed in years gone by, at least as to the probable prognosis, which is now very definite and good. The factor that interests us most pertinently to-day is whether the pterygium has ceased to grow or it is still in an active state;

thus the newer and simpler classification now in vogue, of stationary and progressive types.

If it is of the stationary type we have but one result to attain, and that is the cosmetic effect. If it is of the progressive type, that is one that is likely to continue growing, thus interfering with good vision, it is necessary to remove or so deviate the direction of its progress that it will overcome or correct this tendency, plus the best cosmetic effect possible, with the least trauma and shortest time for resolution.

It is, I am sure, not necessary at this time to go into the differential diagnosis between these two types, further than to state that it is not always possible to make a definite statement in every case. In view of this fact I think it is well to treat such doubtful cases as of the progressive type, for recurrence tho rare can and does take place.

The etiology or the theory upon which this disease is based, and the histopathology present, is of some interest to this paper; but not vital, further than to accentuate one phase of any surgical procedure that one might resort to. It has, however, another feature, and that a debatable one, which to me is rather interesting from the standpoint of etiologic theory.

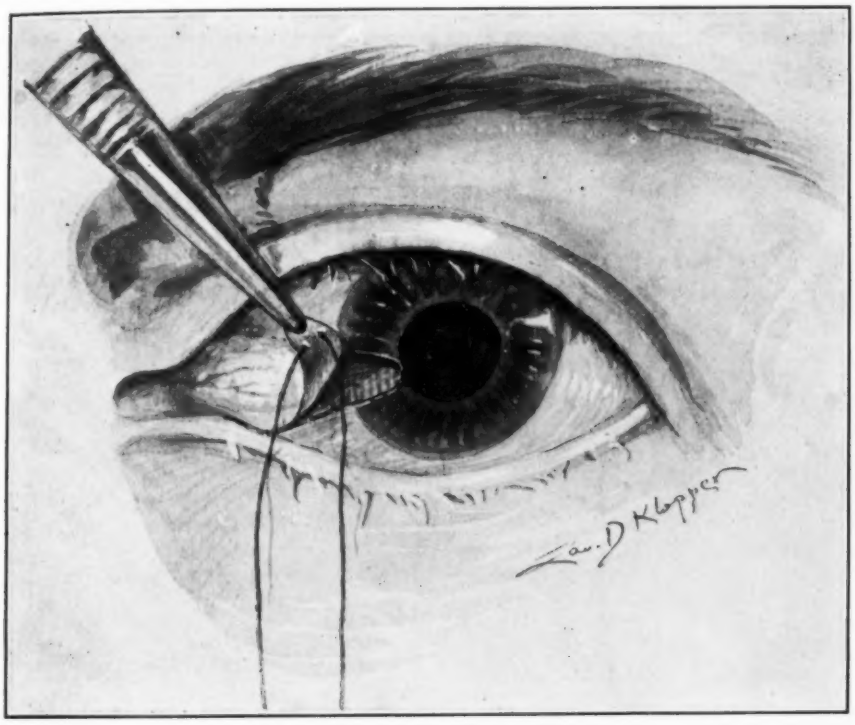

Fig. 2.—Suture passed thru head of pterygium.

We find that Fuchs seems to think that a pterygium is nothing more or less than an overgrowth of a pinguecula in the direction of the cornea, carrying with it the overlying conjunctiva. Collins and Mayou state that a pinguecula frequently precedes a pterygium, but as the ptergyium develops the pinguecula becomes flattened out and disappears. They further state that when the pterygium is very large the semilunar fold becomes decreased in size or may be entirely obliterated. In short that it is an extension of the conjunctiva upon the cornea rather than a new formation of tissue.

I should probably say an extension into the cornea, for not infrequently we find corneal epithelium covering the head of the pterygium and sometimes a destruction of Bowman's membrane and the superficial layers of the substantia propria. It would seem, according to Fuchs' description of the histopathology of a pterygium and Collins and Mayou's description of the hyalin material fused together, just under the epithelium or in the superficial layers of the sclera, with a new formation of elastic tissue which shows signs of degeneration. This would appear to me quite different from the histopathology of a pterygium as described by Fuchs, and in view of the fact that the pinguecula is triangular in shape with the base directed toward the cornea, and

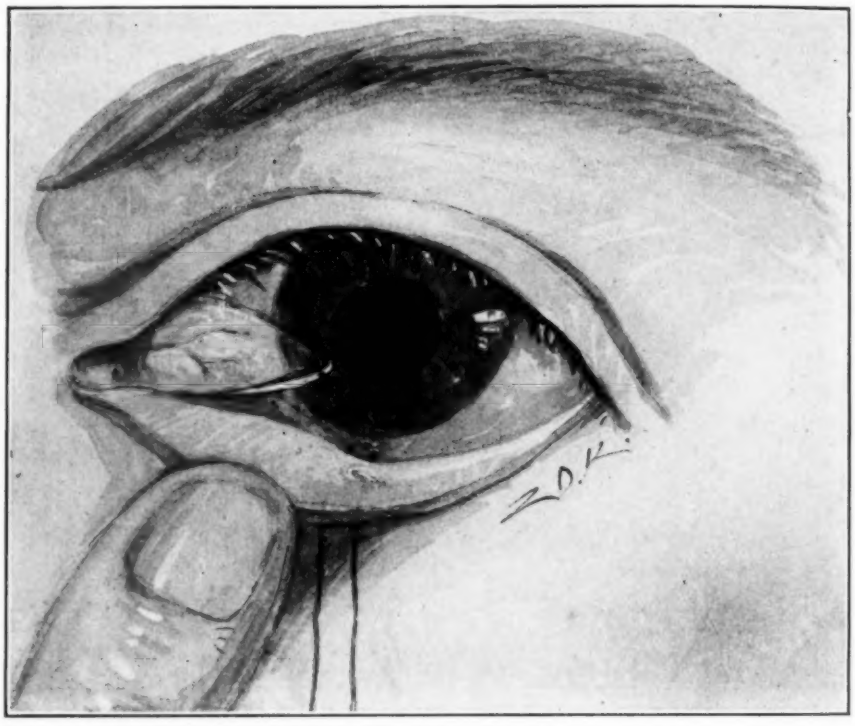

Fig. 3.—Suture passed thru lower lid below the tarsus.

microscopic findings of a pinguecula, that they were somewhat opposed to each other. According to Fuchs the pterygium is identical with the conjunctiva of the eyeball. He further adds, in the tissues of the pterygium are found new formed tubular glands and also large spaces lined with epithelium from which small cysts may develop (I recently removed such a cyst), which is frequently seen in over growth of the conjunctiva in other conditions.

According to Collins and Mayou a pinguecula consists of a finely granular the pterygium an elongated triangle with its base in the opposite direction, it would seem to me a rather radical departure to say that the base of the pinguecula moves forward, while the base of the pterygium remains fixed and the apex advances. In other words the two triangles are superimpose, moving in opposite directions. It would therefore seem that the more rational deduction would be that the two conditions were distinct entities; both susceptible to probably the same irritants or conditions, and responding alike according to their own histology;

for upon the development of the pterygium the pinguecula disappears, probably due to the added protection. For are they not, both limited to the intrapalpebral spaces?

In view of these facts, which to me seem quite important, I always thoroly curette the underlying tissues, using a sharp instrument, whether it be for the removal of the stationary or progressive type, and cover the operative field with healthy conjunctiva.

I am nevertheless inclined to think that if the patient were to live as many years after any surgical procedure one might resort to for this condition as the number of years that had passed before its development, a new pterygium would again appear.

The surgical technic is very simple, without danger and positive of result. That which I have to offer is neither new or startling, probably laying a little more stress upon certain steps in the operation and offering one slight modification in the procedure for the progressive type.

TECHNIC. In the removal of the stationary type of pterygium, after the usual preparation, I try to do as complete an extirpation as possible. First dissecting off what development may be present upon the cornea and carrying my dissection up to the plica semilunaris, I try with it to include some healthy conjunctiva above and below. I then undermine the conjunctiva above, below and to some extent around the limbus. Then using a sharp instrument I thoroly curette the exposed cornea and sclera. Then I bring the conjunctiva together with 3 or 4 interrupted silk sutures, which can be removed in 4 or 5 days.

For the removal of the progressive type, I use a slight modification of the McReynolds operation. The neck of the pterygium is grasped by a fixation forceps, thus producing slight traction upon its head, and at the same time

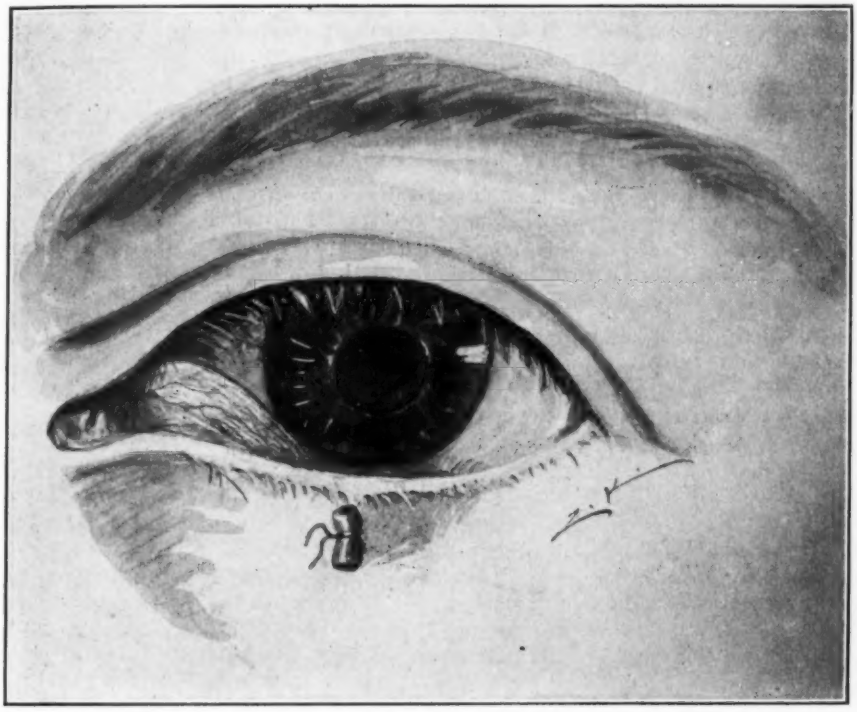

Fig. 4.—Suture tied over rubber tubing. Operation completed.

permitting a cleaner dissection. After this is accomplished as thoroly as possible, including the grayish tissue present on the cornea, with a straight blunt pointed scissors I make a 2 or 3 mm. cut in the upper part of the pterygium next to the limbus. Then the lower border of the pterygium is cut from the limbus to the semilunar fold. (Fig. 1.) Then the conjunctiva is undermined above, below and around the limbus as in the preceding type, going into both fornices.

After thoroly curetting the exposed area, a double armed silk suture is passed thru the head of the pterygium (Fig 2) and carried under the lower part of the conjunctiva or into the pouch and brought out upon the cuticular surface of the lower lid below the tarsus. (Fig. 3.) The assistant then grasps the cut edge of the conjunctiva with a forceps and exerts slight traction upward, while the surgeon produces traction upon the sutures in the opposite direction, thus carrying the head of the pterygium deep into the lower cul de sac. The sutures are then tied over a small piece of rubber tubing or gauze roll, on the outer surface of the lid. (Fig. 4.)

This slight modification of the McReynolds' operation I have performed many times in the past few years, with uniformly good results. Its only advantages are its simplicity, less reaction owing to the absence of a foreign body in the fornix, and almost impossible detection at the sight of the procedure in later years, with the exception of the scar tissue in the cornea. This latter fact is probably due to the ability to produce greater traction upon the pterygium, thus spreading the growth uniformly and retaining it taut until union has taken place.

CAPSULOMUSCULAR ADVANCEMENT WITHOUT INCISION.

S. LEWIS ZIEGLER, M.D.

PHILADELPHIA, PA.

This operation should include firm scleral anchorage, whip-stitch fixation of the muscle margins with equal parallel pull, inclusion of the capsule by a double loop and a single suture removable externally. In the first stage the tendon is raised and sutures passed movable externally. In the first stage the tendon is raised and sutures passed thru thru conjunctiva and tendon from without inward. In the second stage these sutures are passed ten millimeters farther back from within outward. In the third stage each suture is carried forward near the limbus and dipped into the sclera. In the fourth stage the free suture ends are tied and the knots drawn to slightly overcorrect the squint. Two illustrative cases are reported. Read at the Philadelphia meeting of the American Academy of Ophthalmology and Oto-Laryngology, Oct., 1921.

Simplification of technic is the order of the day in all surgical procedures. It was this thought that impelled me to modify the operation that I presented before the American Ophthalmological Society in 1914, entitled "A New Operation for Capsulomuscular Advancement Combined with Partial Resection."[1] I have simply omitted the resection of the muscle and eliminated the incision thru the conjunctiva, thus making the operation one of tucking the muscle or as I prefer to call it of "crumpling," since the distribution of the wrinkles in the three superimposed tissues, muscle, capsule and conjunctiva, suggests this appearance.

It was my good fortune to see many advancement operations performed by de Wecker in the early nineties; and somewhat later to observe the work of Knapp, who greatly improved on de Wecker's technic, by employing Critchett's method of introducing the sutures. This latter operation proved most successful among the many readjustment procedures that were undertaken to restore the lost function of over corrected eyes, that were so common in those early days of radical complete tenotomies, accompanied as a rule by too free division of Tenon's capsule and the subsequent protrusion of the globe thru the capsular breach. It was on the basis of a similar principle that I planned my original operation (1) "Muscular Advancement with Partial Resection and Conjunctival Suture," which I later modified for the sake of increased efficiency under the title of (2) "Capsulomuscular Advancement with Partial Resection; a Single Stitch Method." I now desire to present this modified operation in its final form as (3) "Capsulomuscular Advancement Without Incision," which I believe will prove to be still more practical because of its greater simplicity.

The essentials of success in advancement of the extraocular muscles, from the viewpoint of my own personal experience, are (1) firm scleral anchorage, (2) whip-stitch fixation of the muscle margins, (3) equal parallel pull, (4) inclusion of the capsule by a double loop and (5) single suture removable externally. Firm anchorage must be maintained in the sclera as close to the cornea as possible. Many operators utilize the tendinous insertion of the muscle which they have just resected. This often leaves a thick, unsightly bunch at the seat of operation, which sometimes undergoes proliferation. The muscle must be firmly fixed, without causing strangulation, displacement or tearing of its fibers. "Whip-stitch" fixation of each muscle margin yields the best result of any method so far attempted and permits equal traction on each margin in order to secure a straight parallel pull. Advancement of the capsule along with the muscle always increases the effect; and where the muscle is lame and restricted in its action and thus fails to draw the eye beyond the median line, proves to be the ideal method of restoring its lost function. It is accomplished by passing a double loop thru the capsule. It is especially useful in cases requiring readjustment. A single suture will eliminate confusion and promote simplicity and efficiency. If this suture can be applied ex-

ternally it will prove more accessible for removal and further simplify the procedure. It is better, however, to have this single suture double armed.

The problem of advancement always presents some minor and collateral complications that require antecedent adjustment, in order to make the major procedure a success. If, therefore, indications should demand it, the pull of the opposing muscle should be weakened either by (a) division of capsular adhesions when present, (b) stretching of the tendon or of Tenon's capsule, (c) bilateral partial tenotomy and (d) complete tenotomy where the opposing muscle has undergone contraction. The small amount gained by those procedures is then supplemented by the advancement operation, which can be adjusted to whatever degree is necessary by measurement with the Greek Cross test object, when binocular vision is present, the surgical knot being tightened or slackened before tying, according to the indications noted. Whether much or little is gained by these preliminary and collateral measures, such conditions, if uncorrected, naturally become handicaps that prevent a good result.

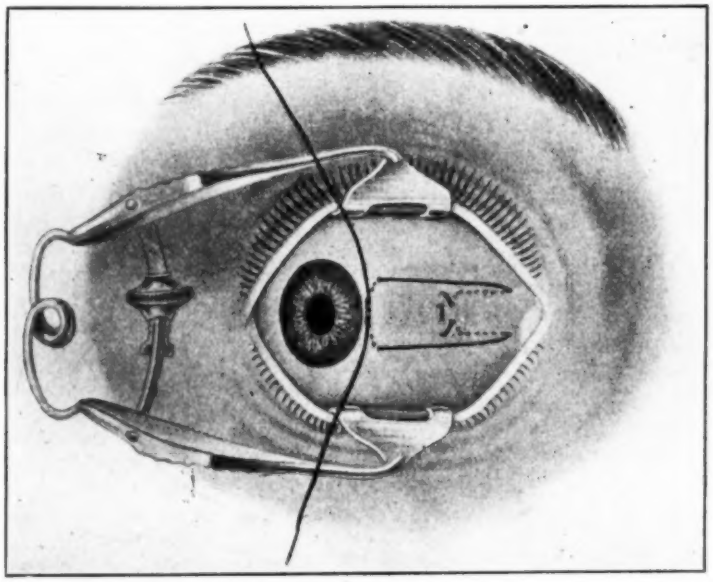

Fig. 1. Single suture entered (1) in "whip-stitch fixation" of each muscle margin, (2) carried backward under Tenon's capsule and (3) brought forward to a "scleral anchorage" near limbus.

OPERATIVE TECHNIC.

First Stage:—The muscle is grasped thru the overlying conjunctiva by fixation forceps about 15 mm. back of the sclerocorneal junction. One needle of a double armed suture is entered thru the conjunctiva and muscle at its lower third. It is then passed toward the sclera and made to emerge thru the conjunctiva at the lower margin of the muscle. The same maneuver is then repeated by entering the needle 2 mm. back of the first puncture and again emerging just back of the first exit, thus forming a "whip-stitch" on the lower margin of the muscle.

The second needle of the double armed suture is now passed, in like manner, thru the muscle at its upper third and again entered 2 mm. back of this point, thus forming a second "whip-stitch" on the upper margin of the muscle. This furnishes a central restraining thread and two lateral binders that will grip the margin tightly without slipping or tearing the muscle fibers (Fig. 1).

Second Stage:—Each needle is now separately carried backward beneath Tenon's capsule on a line parallel with each muscle margin and passed out

to the conjunctival surface about 10 mm. farther back than the "whip-"stitch (or 25 mm. from the limbus) thus forming a double "capsular loop." If desired, a small double perforated plate of celluloid or metal may be threaded onto the silk suture, to prevent it from cutting thru the tissues when forward traction is exerted to "crumple" the muscle.

Third Stage:—The lower needle is now carried forward and entered vertically thru the conjunctiva 2 mm. back of the limbus and 5 mm. below the horizontal plane, dipping firmly into the sclera and emerging 2 mm. below the horizontal plane. The same maneuver is then repeated with the upper needle and suture which should dip into the sclera 5 mm. above the horizontal plane and emerge 2 mm. above the horizontal plane, thus leaving a free, intermediate space of 4 mm. for tying the two ends of the suture. It is well to keep these two suture ends sufficiently far apart to maintain a parallel pull, and allow room for tying.

Fourth Stage:—The two free suture ends are now tied in a primary surgical knot which is steadily and firmly drawn taut until the squint is slightly overcorrected (about 5°). The effect can be measured by the Greek Cross test object and graduated as desired, if binocular vision is retained. The secondary knot is then tied.

All conjunctival rugae should be smoothed out with a silver spatula before finally tying the knot. To prevent distortion of the tissues the two lines of suture should be inserted as nearly parallel as possible and should firmly hold the conjunctiva and subjacent tissues perfectly flat against the sclera, somewhat like a mattress suture. The muscle, the capsule and the conjunctiva are thus superimposed, fixed and drawn forward to the point of anchorage (Fig. 2).

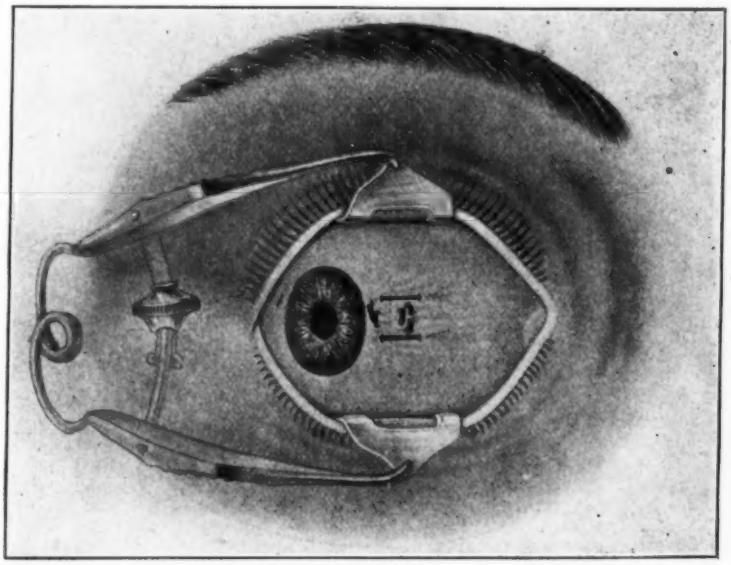

Fig. 2. Suture drawn taut and knot firmly tied. Two parallel threads, knot and whip-stitch are left exposed and easily removable. Tissues are crumpled and held flat.

To secure a permanent result, the suture should be allowed to remain in situ for at least ten days, or until firm union has occurred. If removed before this time relaxation of the muscle may take place. As the knot, "whip-stitch" and parallel lines of suture are exposed on the conjunctival surface their removal is easily accomplished. The central restraining thread of the "whip-stitch" should be cut first, while the knot is grasped with forceps and drawn out with a steady pull. No. 1

braided black silk is preferably used, boiled in equal parts of paraffin and vaselin.

The eye is kept bandaged for a few days. If there is pain, inflammation or edematous swelling, the dressing must be removed and ice pads applied continuously until relieved. The corrugations or thickening of the tissues caused by the "crumpling" will soon smooth out, but the redness often persists for a month.

Fig. 3. (Case 1.) Divergent squint, 60°, corrected. Right eye now rotates beyond median line, to the left.

REPORT OF CASES.

CASE 1.—Mrs. J. L., aged 28 years, consulted me on April 22, 1918, with vision of O.D. 20/50, J-3; O.S. 20/30 pt., J-1. There was pronounced divergent strabismus, O.D. turning out about 60°, with inability to converge beyond the median line. Patient believed the condition to be congenital.

Operation:—On May 15, 1918 both external recti were divided and traction made above and below with the tenotomy hook, but this only partially straightened the eyes and O.D. still failed to pass beyond the median line. The internal rectus of O.D. was then grasped by forceps and with a double armed single suture, a "whip-stitch" was made on each margin of the muscle to fix it. This suture was carried back to form a double loop thru capsule and conjunctiva and brought forward to the sclerocorneal junction where it was anchored securely in the sclera. A primary surgical knot was tied and traction made to pull the muscle and capsule forward, until the tissues "crumpled" and yielded an over correction of about 5°. The suture was removed on the tenth day. Convalescence was prompt and uneventful. Refraction under cycloplegia yielded:

O.D. 15/200 S + 2.D. ⌒ C + 1.D. Ax 105° 20/20 pt.

O.S. 15/200 S + 1.75D. ⌒ C + O .75D. Ax. 15° 20/20.

The result of this advancement operation has been permanent during the past three and one-half years, both as to orthophoria and as to restoration of convergence power in the right internal rectus. (Figs. 3, 4, 5).

Fig. 4. (Case 1.) Eyes rotate well to the right.

Fig. 5. (Case 1.) Eyes looking straight ahead. Orthophoria.

CASE 2.—Miss A. W., aged 20 years, was first seen by me on April 20, 1920, suffering from marked convergent strabismus, O.S. turning in about 65° and slightly hypertropic. Excursion was limited to the median line. She was wearing a high correction for hyperopia and the eyes were slightly less convergent when glasses were worn.

Fig. 6. (Case 2.) Convergent squint, 65°, corrected. Left eye now rotates beyond median line, to the left.

Vision of O.D. 20/20 pt., J-2 and of O. S. 1/200. O.S. had been injured at 7 years of age by a tin can which cut the cornea and iris and probably bruised the lens. There was adherent leucoma on the nasal side, and a slight opacity of the anterior surface of the lens.

Operation.—On May 11, 1920, capsulomuscular advancement of external rectus O.S. was made by suture alone without incision, which brought the eye almost into position. This was supplemented by making a small conjunctival incision over the internus, inserting a tenotomy hook and stretching the muscle above and below, as recommended by Panas and Fox. In doing this a small capsular adhesion was found above and divided, thus permitting the eye to return to normal level. As the external movement of the globe was still somewhat limited, a partial tenotomy of the internus was performed which greatly improved excursion.

A bandage was worn for two days. The "crumpling" of the muscle was evident for one week, but there was no reaction. The redness, however, persisted for one month. The suture was removed on the twelfth day. Under cycloplegia the following error was found:

O.D. 20/200 S + 3.50D ⊃ C + .62D. Ax 105° = 20/15 pt.

O.S. 1200 S + 1.75 ⊃ C + .37D. Ax 90° =20/100.

These were ordered with a slight reduction in the right spherical.

Examination on December 8, 1920, showed that the movement of the eyes was excellent in all directions and that excursion of O.S. to left side had been fully restored. There remained an esophoria of P 5° base out. The result

of this operation has been permanent for eighteen months (Figs. 6, 7, 8).

A review of this case shows that there were three difficulties to be overcome: (1) long continued over convergence from suppression of the image in O.S., (2) contraction of the internal rectus and capsule over it, which required stretching and partial tenotomy to restore excursion beyond the median line and (3) adhesion of the capsule to the globe at the upper margin of the internal rectus causing hypertropia.

Fig. 7. (Case .) Eyes rotate well to the right.

One of the chief advantages of capsulomuscular advancement without incision is that both capsule and muscle are brought forward together, instead of being separated by the sweep of the tenotomy hook. The question has been raised as to how an unexposed and undisturbed capsule and muscle can unite in a new position on the globe without incision or scarification of the tissues invloved. It must be evident that the "crumpled" muscle and the pressure of the suture against the superimposed tissues in a new position will cause plastic exudate to be thrown out, just as in the de Wecker-Knapp capsular advancement or in any other advancement, since union always occurs on the bulbar surface and not at the cut end of the muscle. We do not scarify the surfaces in any of these methods of advancement, but depend on severance of the tissues by the tenotomy hook. Displacement of the tissues by "crumpling" will cause the same effect.

Capsulomuscular advancement has a distinct advantage in all cases where the excursion is limited, or where the muscle is paretic, or where readjustment is required. This single stitch method without incision is an improvement on my former method of partial resection, and in my practice has supplanted all other operations for muscular advancement. It possesses, therefore, all of the advantages which I claimed for the former method, with none of its disadvantages:

1. Firm scleral anchorage.

2. Whip-stitch fixation of each muscle margin.

3. Double capsular loop passed backward from insertion of whip-stitch.

4. Splintlike support of the muscle by parallel lines of suture laid across the superimposed conjunctiva, capsule and muscle, all of which are advanced together.

5. Straight traction on both muscle edges.

6. Graduated control while the suture is being tied.

7. Single suture, removable externally.

8. Tucking or "crumpling" of the muscle without an unsightly knuckle.

9. Reposition of the globe thru advancement of the capsule.

10. Globe cannot slip farther back if suture yields, as is possible in resection.

Fig. 8. (Case 2.) Eyes looking straight ahead. Slight esophoria (5°) when glasses are omitted.

ON THE PERMANENCE OF THE RESULTS OF MOTAIS' OPERATION.

H. Dickson Bruns, M.D.

NEW ORLEANS, LA.

This operation is believed to be suited for complete as well as partial ptosis, if uncomplicated. In the case here reported the results remain complete and satisfactory after twelve years.

In the *La Clinique Ophtalmologique* for October, 1921, our distinguished confrere Professor Jocqs has an interesting little paper giving an account of three cases on which he operated for ptosis, one of whom he had been able to see again after twenty years, the second after 23 years, and the third after twenty years. All had been operated on by different methods, and we know Professor Jocqs' comments upon them are both interesting and instructive. He concludes his article, however, by saying that he does not think Motais' operation is indicated in cases of complete ptosis. "Even," says he, "in incomplete ptosis we have to reckon with the danger that relaxation of the muscular tongue is possible after a certain number of years."

I have lately seen a young woman, then 16 years of age, upon whom I operated in 1909 for an absolutely uncomplicated congenital ptosis of a quite complete degree. On May 20, 1909, I did a Motais' operation under local anesthesia on the left eye. An adhesive strip was applied from the middle of the upper lid to the forehead in order to immobilize it and take off any strain on the recently grafted tongue. Over the eye a watch glass was held in position by adhesive strips after the eye had been filled with 10% argyrol solution. The cover glass was covered with plain aseptic gauze over which was thrown a gauze bandage. On the following day the cornea seemed to be hazy at the upper nasal margin. Atropin was instilled, and a 15% argyrol ointment introduced into the lower conjunctival culdesac. The watch glass was replaced and held in position by adhesive strips and a light bandage. The patient made an uneventful recovery, all dressings having been discontinued after three days.

Fig. 1. Result of Motais operation on left eye remaining after twelve years. (Bruns.)

On October 12, 1909, the muscle balance tested with a Maddox rod at 20 feet showed an esophoria of 3 degrees, and a left hyperphoria of 5 degrees.

The patient was next seen on March 6, 1920, and the following notes were made:

"Operated on for congenital ptosis, left eye, 1909. The patient is now a grown woman and is married. She complains of headache. She had influenza last year and thinks she had it again lately.

The Javal instrument shows: R. 2.00 axis 90°; L. 3.00 axis 80°. Lenses: R. +1.50 ⌒ +1.50 cyl. axis 90° =

20/20 mostly. Left +2.50 ⌒ +2.50 cyl. axis 80° = 20/21—20/40. These were ordered.

The cornea and conjunctiva are normal. She can close the left eye entirely, but when no special effort is made a palpebral opening about 1/6 of an inch wide remains, and she tells me that this is the condition when she is asleep. This was exactly the state of things immediately after the operation; and her condition is to-day just what it was when the photograph was taken on June 22nd, 1910. On December 22, 1921 vision with glasses L.E. = 20/30, some letters. Maddox rod at 20 feet, exophoria 1° esophoria degrees and no hyperphoria. All else as before.

It seems to me therefore, that we need not apprehend stretching of the musculo-tendinous tongue, or slip, after a sucessfully performed Motais' operation.

Perhaps I might be allowed to add that this operation seems to me to be indicated only in uncomplicated cases of ptosis; and that I do not think a total ptosis of this kind is a contra-indication. We must all agree with Professor Jocqs, that in complicated cases it is by no means the operation of choice.

SECOND EDITION OF THE JENNINGS SELF RECORDING TEST FOR COLOR BLINDNESS—AN ESTIMATE OF THE VALUE OF THE TEST.

J. E. Jennings, M.D.

ST. LOUIS, MO.

The changes in the test as here described were based on a series of examinations of persons with normal and subnormal color sense, and after consideration of various criticisms that have been offered regarding the test. These criticisms are discussed and objectionable colors, stone color and violet, have been eliminated. For correct results a trained examiner and a variety of tests are necessary.

The Jennings Self Recording Test for Color Blindness has now been in use for six years. It was first adopted as the standard test by the St. Louis and San Francisco R. R. Company, and later by the Missouri, Kansas and Texas System. During the World War the army, navy and aviation services of the United States Government used the test very extensively, and several hundred thousand men were examined. From this unusual and comprehensive trial, it is possible to come to a very fair estimate of its value. Every one admits its good features, i. e., its compact form, easy portability, freedom from loss or soiling of the worsteds, small size of each color patch, and speed of the test. There is a difference of opinion as to the value of the self recording feature. Some warmly favor it because a permanent self record is made of the color sense, which protects the men against an arbitrary decision of an inexperienced examiner and preserves the facts of the case for the information of the expert. Others think that there is great danger of rejecting a large number of men who have sufficiently normal color perception for all practical purposes.

This point is discussed in an excellent paper on Color Blindness by George L. Collins, Surgeon U. S. Public Health Service, and published in Public Health Bulletin No. 92, 1918. He says "of just what value is the record thus secured, however, is a matter of question. To decide this the writer decided to compare and study the results of the Jennings Test carefully and deliberately given 50 persons of known vision, refraction and ocular conditions, with the results of the Edridge-Green Lantern and Williams Lantern and the Holmgren worsted tests given the same persons . . . Results of the *examination*: of the 50 persons examined, 39 were able to pass the Edridge-Green Lantern and Williams Lantern and the Holmgren worsted test with no mistakes of any

kind, and they may, therefore, be considered as possessors of perfect color-sense. Of these 39 normal sighted persons 24—or over one-half—made some form of mistake in doing the Jennings Test. Ten of these persons, or about one-fourth, punched the hole at the skein marked A 4 on the diagram when given the green test skein. The skein corresponding to A 4 is not regarded as green, according to the Jennings Test, but the person with normal color sense detects a distinct green mixture in this worsted, and about one in four persons with normal color-sense punched it. Of these 39 persons passing the first three tests perfectly and who may be considered as of normal color-sense, fourteen—or about one-third—made mistakes in the Jennings Test when given the rose test skein. These normal sighted persons averaged 3.7 mistakes with the rose test alone, one person making as high as 10 mistakes—or what the test would class as mistakes. The skeins most often chosen by these persons as resembling the rose test skein corresponded to the spaces B3, D10, C6, D11, H15 and K3. E2 seems a perfectly admissible pale rose, but was often overlooked in the variegated field of more vivid colors before the eyes."

When we come to analyze the mistakes most frequently made by the 39 men, we find that on the green color board it was A4. This is a dark stone color with a tinge of green in it, and should not have been included in the test, because when punched it rather indicates an acute color sense than otherwise. The mistakes made in the rose test were all various shades of violet. The question naturally arises has a man a normal color sense who matches violet with rose? Yes and no. In the first instance, the normal eye looking critically at the violet, detects the slight tinge of red and matches it with rose. In the second instance it indicates a shortening of the violet end of the spectrum; but as the color sense of this type is normal for all practical purposes, matching violet with rose should not be counted as a mistake.

In the U. S. Naval Medical Bulletin, Vol. XV, No. 4, October, 1921, E. J. Grow, Captain Medical Corps, United States Navy, has an interesting paper entitled "Remarks on Color Blindness, together with some of the objections found with a few of the color perception tests now in use." He says: "One hundred persons representing 20 officers and 80 enlisted men in the United States Navy, all of whom were previously shown to be free from color defect, at least to any degree which would be disqualifying for a seafaring life, were each put thru the Jennings Test. The result showed that 31 enlisted men and 9 officers made from one to five mistakes each, and according to the test every one of these individuals would have been a case for rejection. From this it would appear that with the Jennings Test we would be in great danger of rejecting a large number of men who had sufficiently normal color perception for all practical purposes." As he does not mention the mistakes made, whether it was merely missing one or more of the test colors, or punching violet for rose, we are left in the dark as to the facts. However, to show how groundless his fears are, I will introduce here a letter from Dr. R. A. Woolsey, Chief Surgeon of the St. Louis and San Francisco Railway System:

"Following your request for information regarding the color sense of the last 500 men examined on the St. Louis and San Francisco Railway, I wish to report as follows; 500 men examined, 6 were color blind, 3 punched K6, brown for rose, but were passed, 7 punched A4 for green but were passed, 1 punched C9, fawn for green, but was passed, 8 punched violet for rose, but were passed, 26 missed one or two of the test colors, but this was not considered a mistake. Out of 494 not color blind, 475 made no mistake whatever. That we found only six color blind men out of a total of 500, is to be attributed to the fact that a very large percent of these applicants had been previously examined, either on

this road, or on some other. I would like to state further that we have examined over 25,000 applicants since discarding the Thomson stick in favor of your Self Recording Color Test, and can say that we are more than satisfied." How can we reconcile this wide difference between Governmental tests and those made in civil life:

Tests in the Public Health Service, 39 examined, 24 made mistakes.

Tests in the U. S. Navy, 100 examined, 40 made mistakes.

Tests in Railway Service, 494 examined, 19 made mistakes.

The only explanation I can give is that the medical officers adhere too rigidly to instructions and count as mistakes a failure to punch one of the test colors. In the ordinary Holmgren set there are perhaps 10 or 12 green skeins, yet if the man examined only picks up 6 or 8 no one would be foolish enough to reject him on that account.

Two other objections to the self recording test are mentioned in Dr. Grow's article. 1st "that the record blank may not be placed in the box according to instructions, thereby renderinging the result of this examination of little value." I have not encountered this difficulty in civil practice. It rather reflects on the capacity of the examiner than on the efficiency of the test. 2nd. "That any scheme where the test yarns are in a fixed position readily lends itself to memorization." I agree with Dr. Grow on this point; at the same time when we remember that there are sixty-four color patches on each color board, 128 in all, and that the box may be turned in any one of four positions, it would seem to be an exceedingly difficult feat to accomplish.

The objection that the worsted may fade is hardly worthy of consideration. In my experience it is the soiling of the worsteds by handling rather than fading that destroys its usefulness.

The last objection which is urged against all worsted tests is that they fail to detect those cases of color blindness resulting from a shortening of the red end of the spectrum. Now is this so, or is it merely an assertion made by some one years ago and repeated so many times in articles on color blindness, that it has come to be regarded as a fact? For a little light on this subject let us turn to Color Blindness and Color Perception, by Edridge-Green, known to all as a past master on the subject of color blindness. On page 117 he says, "I have found that an examination with colored wools gives us very accurate information as to the color perception of an individual." Page 128, "A very common mistake due to shortening of the red end of the spectrum is the confusion of pink (rose) and blue." Therefore, when a man matches a dark blue with the rose test skein, there is probably a shortening of the red end of the spectrum. Another surprising fact awaits us. The statement has been made repeatedly by writers that the value of the lantern is its ability to detect shortening of the red end of the spectrum. When we read on in Edridge-Green, we find that he *uses the spectroscope to detect shortening of the red end of the spectrum* and not the lantern. On page 137 we have the following case report: "B-a a 4 unit. Spectrum shortened at the red end. *Lantern test*: Tested at a distance of fifteen feet with the standard red and green lights, he was able to recognize these under all conditions of obstruction. He also correctly named the neutral glasses when shown alone." Page 154. "F. A. a 3 unit. Red end of spectrum was shortened one-third. *Lantern test*: He distinguished red from green easily under ordinary circumstances and when these were combined with the neutral glasses." *"He made many mistakes with the worsted test and matched blue with rose."* I do not mention the above cases to question the value of the lantern test, but only to show that a shortening of the red end of the spectrum is not as easily determined as we are led to believe.

Relative to the use of the Edridge-Green lantern, on page 731 of his article, Capt. Grow says: "It is a much more difficult test to understand than Holmgren's, and likewise presents far

greater chances for error in results. It is not a test for the novice."

If the Jennings test, or the Holmgren worsteds, do not eliminate persons with a shortening of the red end of the spectrum, how can we account for the fact that, as Dr. Grow says, the test has been standard in the Navy for 40 years, and yet no serious accident has occurred which could be attributed to defective color perception?

As mentioned before, the self recording test was largely used in the World War. In answer to an inquiry, Dr. Eugene Richards Lewis, Los Angeles, Cal., Col. Air Medical Service, very kindly sent me his experience with the test. He says: "After having had charge of the sixty-seven examining units of the Air Medical Service during their examinations of considerably more than 100,000 applicants for admission to the air service training schools—and after the additional experience as a member of the Medical Research Board U. S. Army Air Service from its inception to March, 1919, I feel that I can speak with authority concerning certain things connected with air medical work. I am convinced that the Jennings Color Test provides an adequate and practicable method of examining the color perception of these applicants with a degree of efficiency which was not promised by any other test with which I am familiar. I doubt that any other method of registering their color perception could have approached it in reliability and ease of standard applicability. There were instances in which it failed to negotiate the difficult problem of detecting prelearning of the test—the applicant securing beforehand (and practicing upon) one of the color boards. These mistakes are, however, to be placed to the credit of the individual applicant's determination to get by, rather than to the debit of the test's efficiency. There were also instances of mistaken rejection of applicants with normal color perception—in most of these, the fault lay in a too militaristically rigid adherence to the letter of instruction by the inexperienced examiner, disqualifying upon the basis of erroneously punched marginal shades of the primary colors. . . You are to be congratulated upon devising such a test and the air medical service is to be congratulated upon its availability at a time when the elements of speed and universal applicability assumed such great importance."

After considering the mistakes liable to be made by persons with a normal color sense, a second edition of the test has been issued by McAllister & Co., 132 Market street, Philadelphia. The objectionable stone color and all of the shades of violet have been removed. With these changes made I feel confident that the cause of much confusion has been eliminated. Of course, it is to be understood that failure to punch one or two of the test colors is not to be considered a mistake.

In conclusion it may be remarked that the variety and degree of color blindness is infinite. No test has ever been devised that will detect every one. If an examiner is to be the arbiter in a given case, he must be an expert thoroly trained to make a *variety* of tests. As this is hardly possible, when in doubt the record sheet should be passed upon by some central authority, who has the facts before him. It must be remembered that the Jennings Test is necessarily rigid, in that when a color patch is once punched, it cannot be recalled. For this reason the examiner should take time to explain the test and not allow the record blank to be punched until the applicant understands just what is required. Above all don't reject a man who in his agitation or ignorance happens to punch in a wrong opening. Investigate, explain and try him again with a new blank, or refer the man to the central authority.

SOME ASPECTS OF THE STATUS OF COLOR VISION.

BURTON CHANCE, M.D.

PHILADELPHIA, PA.

Certain historical points regarding color vision are mentioned. The parts of the visual apparatus concerned with perception are reviewed. The function of adaptation is discussed with the effects of illumination upon color perception. The luminosity of different parts of the spectrum is considered, with structural and chemical changes attending vision. The field of vision for colors is considered and then the evolution of color vision as traced in the lower animals, primitive races and children. Read before the Section on Ophthalmology of the College of Physicians of Philadelphia, November 17, 1921.

It has been many years since any systematic discussion of the subject of Color Vision has been offered at this Section, at least not since the memorable contributions of William Thomson and of Oliver. In the past 30 years the subject has engaged the attention of the physicist, the physiologist, the psychologist, and, but rarely, the ophthalmologist. Such a lack of attention on the part of the ophthalmologist is not to be wondered at, because observation requires a knowledge of and the experience in the use of complicated and elaborate apparatus in an adequately equipped laboratory, together with an abundance of normal subjects. Moreover, the busy ophthalmologist cannot undertake to pursue a course of research with any prospect of a leisurely devotion to it, with the certainty of bringing his investigations to a satisfactory conclusion. He therefore must remain an interested spectator of the operations of others.

You, Sir, and your committee, have deemed it a worth-while disposition of the time, to have presented to-night "Some Aspects of the Status of Color Vision," especially as there has been carried on recently in the British newspapers, medical, and other scientific Journals, as well as in the British Journal of Ophthalmology, a polemic and decidedly personally critical discussion of the enigma of color vision, occasioned by the publication of Edridge-Green's "Physiology of Vision." This book is an extremely individualistic work; it embodies Edridge-Green's personal study in the past 30 years. As might be expected, the author makes dogmatic statements on the value of the results of many of his observations and ideas. These he marshals into forces which he proceeds to align in such a way as to create a theory of his own design, without offering to the unlearned student the results of the observations of other investigators, for long generally accepted by most accredited authorities, but to many of which he is diametrically opposed.

The literature on Color Vision is enormous and is increasing in volume day by day. It speaks to most of us in an unknown tongue; the nomenclature is generated and enlarged by observer after observer as he proceeds in his daily studies. [The Editors of the AMERICAN JOURNAL OF OPHTHALMOLOGY are making every effort to analyze the year's publications in Color Vision for presentation in the issues of "Ophthalmic Literature."]

For those who would seriously undertake the study of Color Vision, I would recommend as a standard basic work, Parsons' "Introduction to the Study of Color Vision," not, however, as a compendium to take to the links to occupy any hiatus in one's thoughts between the events of the game's rounds. It is an encyclopedic work filled with references and citations with that degree of accuracy and completeness which has characterized all that that great compiler has published. From it I have drawn not a little in the preparation of this lecture. I would reserve Edridge-Green's book until after one has become well grounded in the fundamental principles of the study.

In the short time allowed to-night one can only touch on a few of the topics of vital interest in any consideration of the subject. Our subject is so vast and so many sided, that it is impossible to treat it fully within the limits of a single lecture, indeed I can hardly give as much as a general notion of the scope of this division of science; perhaps a truer and

fairer impression can be conveyed by brief descriptions of several aspects of it than by detailed accounts of one or two. I have therefore adopted this plan even at the risk of appearing somewhat sketchy.

HISTORICAL.

The subject of the Color Sense, is full of fascinating features. Next to astronomy, it has engaged the attention of philosophers from the remotest ages. Centuries ago, in 300 B.C., it attracted the attention of Theophrastus, the favorite pupil of Aristotle, whose work on "Sensuous Perception and Its Objects": in which he made the attempt to deal with the phenomena of color sensations, is one of the few of his many philosophic treatises now extant. A number of centuries passed before the subject again came under notice, perhaps because investigators were deterred from attempting its solution by reason of the abstruseness of the problems, or because the faculty of being able to distinguish colors was regarded as one of the attributes of our existence, and therefore accepted as among the unsolvable mysteries.

However this may be, no record has been found of any further study of color vision until the appearance of Robert Boyle's observations in 1663. Then, in 1672, came the great discovery by Sir Isaac Newton, of the decomposition of white light by means of the prism into the, socalled, spectral colors. Newton's discovery, which has been held by some to be the greatest of his achievements, demonstrated that white light is rarely, if ever, homogeneous, but is composed of seven lights varying in color, which he called in order, red, orange, yellow, green, blue, indigo, and violet. Newton regarded the spectrum of sunlight to be in reality an image of the component parts of the light separated from one another, so that each may be viewed singly, and from this discovery came the spectroscope and all the enlightenments which the introduction of that optical appliance has made possible to science.

It was quite one hundred years later before any activity in the study of Color Vision became manifest, but this was concerned chiefly with the reporting of cases of defective color perception, the contemplation of which led to the promulgation of a Theory of Color Vision by Dr. Thomas Young.

I will leave further historical account of our subject until another time, when I hope to have the honor of presenting to you a brief resumé of color blindness, and state the essential points of the various theories of color vision, which theories are not a little governed in their reasonableness by the facts elicited in observation of the color blind. And, it seems to me, that some such facts concerning color vision as we are to consider to-night are necessary for a comprehension of the ideas embodied in the theories held by their advocates.

VISUAL SENSATIONS.

Our visual sensations comprise colorless and color sensations. The series of colorless sensations include every shade of grey between the deepest black and the most blinding white. Color sensations include not only the various "spectral" hues which are afforded by the analysis of daylight, but also others which are not to be thus obtained, as purple and carmine.

Ordinary sunlight, by appropriate means, can be split up into its component "rays" which differ from each other in their wave lengths. Certain of these are visible and constitute "Light," in the narrower sense, but instead of giving rise to the sensation of white light, they show, to the majority of persons, certain pure colors, in the following order, red, orange, yellow, green, blue, and violet. When white light is passed thru a glass prism, as in Sir Isaac Newton's original experiment, a spectrum is obtained: at one end is red, which has the longest and at the other violet, which has the shortest wave length; the intervening colors being produced by waves of intermediate lengths.

The limitation of the spectrum at the violet end is less precise, because the rays in the neighborhood are changed into rays of greater wave length by the media of the eye, particularly the lens and retina. This "fluorescence" causes them to produce a lavender hued sensa-

tion, which does not denote true visibility of the short wave length rays. Beyond the red end are waves of greater length, which when absorbed cause a rise in temperature. Beyond the violet end are waves of smaller wave length which are capable of causing chemical action. So striking is the physiologic phenomenon of the visibility of the intermediate series, that the heat rays are commonly spoken of as "infrared," and the actinic or chemical rays as "ultraviolet."

Pure spectral colors rarely occur in nature, therefore, much of the literature on color vision is devoted to observations with pigments, colored glasses, and so on. It is necessary, therefore, to say a few words about these complex colors. When white passes thru a red glass or transparent red fluid, certain rays are absorbed by the medium. The red rays, however, are transmitted in greatest quantity, so that the dominant color of light reaching the eye is red; but it is not pure red. Most blue substances, such as copper salts, allow the blue rays to pass, but also some of the green and violet, and a few of the red and yellow. Yellow substances allow much red and green to pass as well as yellow, but little blue and violet. The true composition of the transmitted light can be determined only with the spectroscope.

PARTS OF THE VISUAL APPARATUS AFFECTING PERCEPTION.

As might be expected all light sensation is affected by the various media and structures of the eye. It is not necessary for us to dwell long on the ordinary details concerning these structures; it is of interest, however, to know that the optical system of the eye is not achromatic. The crystalline lens normally possesses a slightly amber-yellow hue, which is inappreciable in youth, but with advancing years it becomes tinged with a yellow pigment. The effect is similar to that occasioned by the macular pigmentation. And, it is of importance to bear in mind, in estimating the visual sensations of elderly people, that the color of the lens causes an appreciable absorption of the more refrangible rays, green, blue, and violet.

The macula lutea, as its name implies, is permeated with a yellow pigment, the amount of which varies considerably in different individuals. Therefore, the influence of the macular pigmentation is of great moment, for because of it, certain spectral rays are absorbed more than others. The variations in color matches and in the estimation of complementary colors, by various normal sighted individuals, has been attributed to this cause. This variation in individuals is purely physical, and must not be confounded with allied variations which are due to physiologic abnormalities. Of these physical variations and physiologic abnormalities I will speak later on.

The part of the retina to which, for the present purpose, most attention must be directed is that comprising the rods and cones and the pigment epithelium. It has been shown conclusively by "Purkinje's Figures," which depend upon the position of shadows thrown by the retinal vessels upon the percipient layer of the retina, that the primary seat of visual impulses is in the layer of rods and cones. Here the most sharply defined image is formed by the optical system.

The rods and cones, as their names imply, are minute cylindrical and conical structures. They project vertically, or, more accurately, radially from the surface of the outer limiting membrane of the retina. Almost exactly at the posterior pole of the eye is situated a small area in which vision is most distinct. This area is impregnated with a yellow pigment, and hence is called the macula lutea or yellow spot. In the center of the yellow spot there is a conical pit, the fovea centralis caused by thinning out of the retina. In this minute area, the structures are reduced to little more than neuroepithelium and ganglion cells. Moreover the neuroepithelium in this region consists entirely of cones, which are here slender and elongated and are more rodlike than are found elsewhere. This change in the structure of the cones may be evidence of some physiologic combination of the functions of both rods and cones in this situation.

Passing peripherally in every direction from the central fovea, it is found that rods gradually make their appearance between the cones, and sôon the number of rods in a given area becomes greater than that of the cones, so that at the extreme periphery of the retina only a few scattered cones are to be found.

In the researches in color perception three areas of the retina have been distinguished:

The Macula, measuring 1-3 mm.; the Fovea Centralis, measuring 0.24-0.3 mm. in diameter; and the Rod free area, measuring 1-3 mm.

Much knowledge has been gained as to the distribution of the rods and cones from the study of the retinae of lower animals, altho the great variety in forms of the neuroepithelial cells, in the several classes studied, prevents any generalized classification. In the retinae of most mammals, amphibia and fishes, there are rods and cones, the number of rods much exceeding that of the cones. In birds, on the other hand, cones are much in excess of rods. In most reptiles, lizards, snakes, tortoises, only cones are found. There are vertebrates possessing only rods, certain fishes, rays and dog-fish; certain mammals, hedgehog, bat, mole and night apes. There are also animals of nocturnal habits possessing only rods. Owls and mice have only a few rudimentary cones; rats also possess a few cones.

Hess has found rods in fowls and pigeons, tho there are a few in the posterior and superior parts of the retina which are most used in pecking. He found a fairly uniformly distributed, "not inconsiderable number" of yellow or brown oil globules in the retina of the owl and hawk, but these are present only in cones. As regards nocturnal birds, contradictory statements have been made by various authorities.

Colored oil globules are found in the cones of birds and reptiles; similar colorless bodies are found in fishes and amphibia. The globules are more deeply colored, yellow or brown, in night birds and in tortoises than in day birds. They are absent in the crocodile.

ADAPTATION.

Vision is profoundly affected by the condition of the retina at the moment of stimulation and by the nature of the stimulation to which the retina has been previously submitted.

When we pass suddenly from bright sunlight into a dimly lighted room, we can see nothing for a time until we become "accustomed to the darkness." When we pass from the dark into bright light, vision is also difficult and may be painful. We therefore infer that the sensibility of the retina becomes increased at low illuminations. This automatic process of leveling the sensibility of the retina to the requirements of the moment is called dark, or light, "adaptation."

Parsons speaks of the light adapted eye as a "photopic eye," and of vision under these circumstances as "photopia"; and of the dark adapted eye as a "scotopic eye" and of vision under these circumstances as "scotopia."

Dark adaptation, and its converse process, light adaptation, essentially depend on changes in the retinal apparatus. Light adaptation takes place with great rapidity, while dark adaptation can be shown to be still incomplete, even after an hour's stay in a perfectly dark room. But not the whole of the retinal surface of our eye is susceptible to dark adaptation. At the fovea dark adaptation is impossible.

Dark adaptation is a relatively slow process. It is characterized by a rise in the sensitiveness of the retina to light, which is slow during the first ten minutes of exclusion of light from the eyes, rapid during the following twenty or thirty minutes, and again slow or almost negligible after that period. The general character of the curve of retinal sensibility is the same in all cases, but there are marked individual variations in the rapidity and amount of rise, thus explaining the fact that some people see very much better in

a dull light than others, tho variations in the size of the pupils and other factors are not without importance in this respect. Mydriatics have an indirect effect; the first slow rise is prolonged from ten to twenty minutes but is followed by the normal rapid rise to the normal height. Certain drugs, as strychnin, cause increase in the amount and rapidity of the rise of sensibility. In nightblind people there may be only a very slow rise, the ultimate sensibility after an hour being near the normal limit. In severe cases there is very little rise even after several hours. Such adaptation is normal in the color blind, even in the totally color blind.

Very short exposure to bright light, e. g., striking a match, causes a very temporary fall without materially altering the course of the curve. The increase in sensibility after very prolonged dark adaptation is more quickly and completely abolished by exposure to light. Dark adaptation of one eye has no effect upon the other.

Under ordinary conditions, yellow is the brightest color sensation given by any simple color stimulus, but when the eye is adapted to sunlight, the point of maximal brightness changes from yellow to green. At the same time blue colors appear lighter and red colors darker than when seen under ordinary illumination. Indeed, so dark does the red end of the spectrum become that its extremity is invisible; the red end of the spectrum then appears shortened. Hence with failing light the brightness of different colored objects alters, the colors towards the red end of the spectrum becoming relatively darker, those towards the violet end brighter, so that finally the reds appear almost black and the blues bright. This fact was first investigated by Purkinje in 1825, and since then the changes in the relative brightness of colors are known as the "Purkinje phenomena" after the name of their discoverer. "Dark adaptation" is the essential factor for the production of the Purkinje phenomenon. The phenomenon can be readily observed at dusk on a summer's evening in a garden of variously colored flowers. They are not due merely to a reduction in the illumination of the colors, but to the adaptation of the eye to twilight. Abney, graphically, yet with great charm, described the phenomenon in his Tyndall Lecture on "Color Vision" before the Royal Institution in 1894:

"At nightfall in the summer the order of disappearance of color may often be seen; orange flowers may be plainly visible, yet a red geranium may appear black as night; the green grass will be grey when the color of the yellow flowers may yet be just visible. An early morning start in the autumn before daybreak will give an ample opportunity of satisfying oneself as to the order in which colors gradually reappear as daybreak approaches. Red flowers will be at the onset black, whilst other colors will be visible as grey. As more light comes from the sky the pale yellow and blue flowers will next be distinguished, tho the grass may still be a nondescript grey. Then, as the light still increases, every color will burst out, if not in their full brilliance yet into their own undoubted hue."

Besides this temporal variation in the sensitiveness of the retina, there is a well marked regional variation. The light sensitiveness of the various parts of the retina must be carefully distinguished from their visual acuity for form. In the condition of light adaptation, the fovea is the most sensitive part of the retina; in dark adaptation the fovea is the least sensitive part of the retina. In other words the fovea is a region of physiologic nightblindness.

The absence of Purkinje's phenomenon at the fovea, when taken in conjunction with the absence of rods at the fovea, suggests that while the cones are concerned with ordinary vision under conditions of bright adaptation, it is the function of the rods to develop colorless sensations in the dark adapted eye. On this supposition the rods become the end organs of colorless vision for dim light.

If a number of patches, colored or colorless, be viewed in a nearly dark room by the sufficiently dark adapted

eye, it will be found that the particular patch to which the eye is turned is invisible, while the others are visible. As soon as the eye is turned to regard any one patch, that patch immediately vanishes. Now the fovea is the region of the retina which ordinarily receives light from a not too large object when the eye is turned to fixate it. Various other pieces of experimental evidence confirm the conclusion that, at the fovea, dark adaptation, the Purkinje Phenomenon and even vision under conditions of low illumination, are absent. So also is the excitability of a given area affected by the condition of sensibility and stimulation of the surrounding areas.

The relative central scotoma in dark adaptation was long ago recognized by astronomers, who noticed that stars of small magnitude were seen better if viewed somewhat eccentrically. They found on viewing the Pleiades, that by direct fixation four or at most five stars were seen, but by indirect fixation a number of weaker stars became visible. The direction is constant for the same eye and varies with different eyes; it depends upon macular balance and refraction rather than upon the specific sensibility of the parts of the parafoveal region.

Altho the fovea is nightblind relatively to the periphery, it is capable of a slight degree of dark adaptation.

Complete dark adaptation is only reached after prolonged exclusion of light. Hence a moderate degree of scotopia is generally present in everyday life, sufficient indeed to elicit the Purkinje Phenomenon merely by sudden diminution of the intensity of the stimulus. If after remaining for a considerable time in a moderately lighted room, the illumination is suddenly diminished, reds at once appear much darker and blues much brighter.

It will be readily appreciated that complete dark adaptation rarely occurs under normal conditions of life. Scotopia is the condition of vision in which there is a relatively high degree of dark adaptation. It will be best to consider the conditions of vision after prolonged stay in a feebly lighted room. If colored objects are viewed under feeble illumination, the colors cannot be distinguished, but all appear to be of various shades of grey. The eye is totally color blind. A spectrum of low intensity appears as a colorless bright streak, varying, however, in brightness in different parts. Consequently accurate matches can be made between any two parts of the spectrum by merely modifying the intensity of one light.

If the intensity of the spectrum is slightly raised the colors become evident in a definite order and the relative brightness of the different parts becomes altered. As the intensity is still further raised, the eye becomes light adapted and the spectrum shows all its hues with the manifestation of relative brightness. Scotopic vision at very low intensities is therefore achromatic; with slightly raised intensities of light it becomes chromatic. We may distinguish the two conditions as achromatic and chromatic scotopia respectively.

LUMINOSITY OF THE SPECTRUM.

In his celebrated book on, "Optics," published by Sir Isaac Newton, in 1704, appears this passage: "It is to be noted that the most luminous of the prismatic colors are the yellow and orange. These affect the senses more strongly than all the rest together; and next to these in strength are red and green. The blue compared to these is a faint and dark color, and the indigo and violet are much darker and fainter, so that these compared with the stronger colors are little to be regarded." It was not until 1817 that exact measurements of the brightness of the various parts of the spectrum were published by Fraunhofer.

As might be expected the significance of luminosity in color vision is of profound importance. It is apparent to all that two white lights of different intensity will impress the senses in different degrees of brightness or luminosity. The measuring of that difference is called "photometry." When lights of different colors are compared, the differences might not be apparent but their measurements may be en-

tirely different. Such comparison is spoken of as "heterochromic photometry."

Heterochromic photometry has become of great importance since the invention of electrical lighting, and a considerable amount of attention has been devoted to it in the estimation of lights for various purposes. It is accomplished by means of an episkotister, which consists essentially of a metal disc containing alternate closed and opens sectors, thru which light may be diffused by rotation. When the episkotister is placed before two lights of different luminosities and rapidly rotated, an unpleasant "flickering" of each light is seen at certain rates of rotation. The disc is rotated until the flicker ceases before each of the lights, and comparisons are then made of the relative speeds.

SPECTRUM AS SEEN BY THE LIGHT-ADAPTED (PHOTOPIC) EYE.

The Spectrum; Hue, Luminosity, Saturation.

If a pure spectrum of moderate intensity is observed, a band of colors is seen. Of these, four are clearly defined as separate and distinct from each other: red, yellow, green, and blue, the red region consisting of the least refracted rays, the blue of the most refracted. Between the red and yellow we distinguish a region which is called orange. The gradation of red to yellow is gradual and it will be generally admitted that orange partakes of the natures of both red and yellow psychologically, the red element diminishing as we pass from red to yellow and the yellow element correspondingly increasing. Between yellow and green a somewhat similar gradation occurs, the yellow gradually becoming more and more tinged with green until we fail to recognize any yellow at all, and the color gives the impression of pure green. Passing further towards the blue an intermediate green-blue region is met with, showing the same gradual transition until the blue no longer gives an impression of green. Passing beyond the blue we gradually come to a region in which the predominant sensation is still of the order "blue," but it is not pure blue. It is called violet. Now violet is a color which occurs rarely in nature. There is, however, a color in nature which is often called violet, but which is really purple. True purple does not occur in the spectrum, but it can be obtained by mixing pure red light with pure blue light, and we can pass from blue to red thru violet and the mixtures of blue and red which are called purple and carmine.

We have thus traveled in a circle and returned to the original starting place, red. This is a very important fact, for it can be proved that with the help of the colors thus obtained, either pure or mixed with each other or with black in various proportions, all known colors and tints can be reproduced.

Speaking generally then, change of wave length causes a change in color, or in the hue or tone of a color. The tone changes most rapidly on both sides of the yellow, most slowly near the ends of the spectrum.

When we combine any color stimulus with another which lies more remote from it on our color circle, we obtain a sensation gradually diminishing in hue and increasing in greyness; that is to say, there is less and less "color" in the resulting sensation, until ultimately a color stimulus lying so far distant is reached that, when presented simultaneously with the other, it yields a perfectly colorless sensation of the black-white series. Every color sensation may be said to have its antagonistic color sensation, in the sense that when the corresponding stimuli simultaneously excite the same retinal area they produce merely a colorless sensation. The red of the extreme end of the spectrum and a certain bluish-green are antagonistic colors; so are purple and yellowish-green, violet and yellow, etc. These pairs of colors are also called "complementary," inasmuch as if one regards a sharply defined patch of one of these colors, and then turn the eye on to a colorless surface, the other member of the pair appears as a "negative after-image."

These observations suffice to indicate how color sensations may vary

not only in color (or hue) but also in "tint." One color sensation may be rich in color, while another, altho of the same color may be poor in it. This poverty is due to the simultaneous presence of some member of the colorless series. The pure spectral colors may be successively mixed with gradually increasing quantities of white light, until they become so pale that eventually no color can be distinguished. They are then said to become less saturated. A red sensation will change in tint owing to the simultaneous presence of grey. If the grey be light or white, the tint will be rose or pink; if it be dark or black, the tint will be brown. So, too, a blue, when fully saturated, yields a pure blue sensation; when mixed with white, greys or black, of the colorless series, it changes the sensation to a pale blue, or sky blue or a bluish-black tint. A "highly saturated" color is one rich in color and contains a minimum of white.

Yet, even when color stimuli are pure, that is to say, when the stimuli consist only of light waves of a uniform length and are freed by suitable filtering media from other waves and from white light, the color sensations thus obtained differ from one another in still another direction, namely in "brightness." Apart from the change in color the most striking feature of the spectrum is the difference in brightness or luminosity of different parts. The brightness varies with the intensity of the light, but if the intensity is increased beyond a certain point the colors also change in tone; not only does it alter the hue but also the saturation, so that eventually it produces only the sensation of white light. It is obvious that the purest yellow sensation is brighter than the purest red or any other saturated color sensation, and similarly that spectral green gives a brighter sensation than spectral blue. The totally color blind person sees the spectrum merely as shades of grey, which may be said to differ only in brightness. Indeed brightness is the one and only character in which sensations of the black-white series differ from one another.

So far, then, we have reached the following conclusions. The series of colorless sensations varies only in brightness; the colored series varies both in hue (color) and in brightness; and by combining stimuli which would separately yield colorless and colored sensations respectively, color sensations may be made to vary in tint.

From what has already been said we see that there are two thresholds of vision, a general threshold, the minimal stimulus producing the sensation of light; and a specific or color threshold, the minimal stimulus producing the sensation of color. The interval between them is spoken of as the colorless photochromatic interval.

Research has shown that, at any rate in lower animals, stimulation of the retina by light is accompanied by structural, chemical and electrical changes.

Structural Changes. The chief structural changes are the phototropic reaction of the pigment epithelium and the contraction of the cones. To these may be added changes in the Nissl granules of the ganglion cells.

When the frog's eye is exposed to light, the pigment granules wander into the cell processes between the rods and cones. The light effect is complete after 5 to 10 minutes' exposure. The retreat of the granules to the complex dark position takes one to two hours. The light effect is limited to the area stimulated, so that an "epithelial optogram," that is, an image of an object formed on the retina, owing to the bleaching of the visual purple, can be produced. These images have been fixed in excised eyes.

The violet end of the spectrum is more strongly "retinomotor" than the red end; the red light causes little reaction. Light on one eye causes wandering of the pigment in both. Light on the skin produces the effect in frogs; so, too, does electrical stimulation of the optic nerve, probably thru the centrifugal nerve fibers. The phototropic reaction of the pigment epithelium has not yet been proved to occur in mammals.

CHEMICAL CHANGES. The most important chemical change caused by the action of light on the retina concerns those observed in the visual purple or rhodopsin. In the outer parts of the rods is diffused a substance highly sensitive to light called the "visual purple." This remarkable substance was discovered in the rods of the frog's retina by H. Müller in 1851. Boll, in 1876, first studied it exhaustively. It occurs in all animals which possess rods, from the lampreys to man; the cones do not contain it, it is present in the rods only. It is therefore absent from the fovea. The importance of this we shall see as we discuss the various theories of color.

The color of visual purple varies in different animals and under different circumstances, and gives different spectroscopic absorption bands. It is rapidly bleached by daylight, the bleaching of which is limited to the area exposed to the light. Light on one eye does not cause any bleaching of the visual purple of the other. In darkness the color becomes slowly restored, the visual purple being regenerated, but only on contact with the pigment epithelium. Regeneration commences in the frog in about half an hour and is complete in one to two hours.

FIELD OF VISION FOR COLORS.

The acuteness of form vision falls off rapidly in passing from the fovea to the periphery, but movements of objects having their images in the periphery are very readily observed. When an object is looked at directly, a sharp image is formed on the fovea and the immediately surrounding area. An object, therefore, which subtends less than 3° at the nodal point of the eye will form its image entirely upon the rod free area of the retina. Larger objects, subtending 4°-12°, will form their images on the macular region, in which only a few rods are present in the peripheral parts. Objects surrounding that fixated form images on the peripheral regions of the retina which are richly supplied with rods.

Thruout the field of view, the color sensibility of the normal retina, just as in form vision, differs according as the image, or the color, is at the fovea or is peripheral. The extreme periphery of the retina is totally color blind.

If we fix a point with the eye, and while we are steadily fixing it introduce a colored patch so that the color stimulus falls on the outermost region the patch is seen as a gray. Now within this totally color blind zone lies a zone which is red-green blind. If the colored patch be orange, it appears grey when the stimulus falls on the extreme periphery of the retina, but when introduced into less peripheral areas it appears yellow; in this zone a yellowish-green patch appears yellow, and a bluish-green, purple or carmine patch appears blue. Finally, at the center, we reach a zone which is sensitive to the red and green if they occur in the color stimulus. Foveal, or central, vision must therefore be clearly distinguished from peripheral or eccentric vision, for we have three zones in the retina, an outer, totally color blind, an intermediate, red-green blind, zone, and, a central zone, of complete color vision. These zones are more accurately described as zones of color weakness. Under proper conditions, the zones for red and green are found to be identical, and so are those for yellow and blue.

Interesting studies have been carried on in the use of colors to outline these zones, and in the gradation of the colors according to the manifestation of the changes in going from zone to zone. The results obtained from observations on the color perception variations in the fields of vision have been used with great advantage to substantiate the arguments advanced by the adherents of the "four-color theory."

The fields for colors are approximately concentric with that for white, their limits being determined by the intensity of the light, and as the colors change in appearance in passing from the point of fixation towards the periphery, the periphery is therefore dyschromatopic rather than achromatopic.

Those at the red end of the spectrum pass thru yellow to grey; those at the violet end thru blue to grey. Blue-green becomes green then yellow-green, then yellowish white.

The limits of the color fields vary not only with the intensity of the light, but also with the saturation of the color, and above all, the size of the object. If these are sufficiently great colors may be recognized, almost, if not quite, at the extreme periphery.

As already mentioned only the foveal region gives the unadulterated photopic reactions, unless the eye is very completely adapted to light, and all traces of scotopia eliminated from the peripheral field. Ordinary observations with the perimeter do not afford accurate details for comparison. Color pigments do not give the same fields as the spectrum colors with which they approximately match, since they are impure colors.

If light adaptation is rendered as complete as possible by exposure to bright sunlight, many points of interest are elicited. Under these circumstances it appears—within the limits of experimental error—that color matches, spectral or composite, which hold good for the fovea remain good when viewed eccentrically, but tho the matches remain matches the values alter, the colors changing in the mid-peripheral region, and becoming colorless in the extreme periphery. It may therefore be concluded, that in the photopic eye peripheral vision differs from central vision only in the direction of a diminution in sensibility, and not in the direction of a change in character of sensation.

Further, all color mixtures which appear colorless by central vision remain colorless by peripheral vision.

EVOLUTION OF COLOR VISION.

We now turn to an entirely different aspect of color sensibility—its development in the individual and in the race. A priori we should expect some light to be thrown upon the fully developed color sense of man by a knowledge of the stages thru which that color sense was evolved. The sources of our information on the evolution of color vision are few and the methods of investigation difficult and arduous. Only recently have the researches been carried out in a scientific manner and yielded results of particular value.

COLOR VISION IN ANIMALS. In the invertebrata, little has been done beyond recording that the animals have been attracted or repelled by lights of different wave length and intensity, as exhibited by movements towards or away from the light; experiment being confined merely to observation of their movements when the cage or trough is illuminated by lights of different colors.

We naturally appeal to the visual sensations of lower animals. Experiments which have been performed upon animals have hitherto thrown little light on the development of color vision; some deductions can be made, however, from the comparative study of the structure of the visual organs. One great difficulty lies in determining whether differences in the behavior of the animals are due to differences in color or in brightness merely. It is only in recent work that adequate attention has been paid to this point. Another and insuperable difficulty is our powerlessness to determine sensation qualities in animals other than ourselves. Even among men, there is reason to believe that no two subjects have precisely the same color sense; all the more so when dogs, mice, birds or crayfish are said to be capable of distinguishing one color from another, we are not in the least justified in concluding that the various colors appear equally different to these animals, or that their experiences of color are comparable to our own.

Experiments on the color vision of the higher animals have been performed by training the animal to react in a prescribed way, say to enter a compartment colored in a given hue, perhaps rewarding or punishing it according as it enters the right or wrong compartment. When once the animal has learnt to react to a given color, the experimenter studies the degree of correctness with which it is able to react

in the simultaneous presence of one or more colors or greys illuminating other compartments. In other experiments, especially on lower animals, the reaction is obtained by offering food on tiles or in forceps of a given color, or by coloring the food.

It is impossible to set forth here the various conclusions which have been reached by different workers. They agree in finding that in regard to color sensibility animals differ widely from one another and from ourselves. The most recent experiments on dogs appear to show that during the early days of training they react so exclusively to differences of brightness, that at this stage of experiment they appear to be totally color blind.

It is only later, after a period of prolonged training, that they show themselves capable of reacting to differences of color. There is no evidence in all the work which has been devoted to animal color vision that red and green vision is generally weak or sometimes absent. Yet one might have expected that red-green vision would prove to be the last in the course of evolution to be acquired, considering the relatively great frequency of red-green blindness in man. Thus neither in animals nor among children or savages, is there evidence of the evolution of the color sense along a definite path.

THE COLOR VISION OF PRIMITIVE RACES. A study of color vision of primitive races may throw some light on the evolution of visual sensations. It may be that some primitive races are in a condition of arrested development of vision, as of other faculties. We have only just crossed the threshold of this part of the investigation and it is to be hoped that no time will be lost in carrying it forward, lest the material for the research be obliterated by the march of civilization.

Interest in the color vision of primitive people was first aroused by Gladstone, in 1858, who in his "Studies on Homer and the Homeric Age," drew attention to the vagueness of the color terminology of Homer, and concluded that the ideas of color at that time must have been different from our own.

It may interest us to read what Gladstone says of Homer's sense of color: "He knew but little and vaguely of the differences of colour, except as approximations to the opposite ideas of light and darkness, both of which he grasped firmly, and turned very largely to poetic use. He never gives an epithet of colour to a flower; never calls the skies blue; and there is no work in the poems which would justify an assertion, that he had any approach to a distinct perception either of green or of blue. Yet so well did he employ his comparatively scanty materials, that his visual imagery is both abundant and highly imposing."

Several words occur in the Iliad for red and one word definitely used for yellow; but a much less definite word for blue or brown. These peculiarities of color terminology have since been found not only to be characteristic of Homer, but also to occur in ancient writings in very different parts of the world. The conclusion has consequently been drawn that our color sense has been evolved in comparatively modern times, that the sensations of red and yellow arose before the sensation of green, and that only at a much later date did the sensation of blue develop.

It has been suggested that the color names of the Homeric Greeks and uncultured peoples might be explained by environment. The Achaians were a subbarbaric race who had reached the stage of culture at which the use of pigments is practiced, but who only employed red and a reddish purple in staining or dyeing. Their color vocabulary is exactly accommodated to such a stage; and Gladstone believed that they could not have understood real colors by their apparent color terms, because the words descriptive of color are used loosely. The later Greeks were themselves aware of the deficiency in their color vocabulary. The superior power of red to strike the attention may be due to the fact that red objects in nature are rare, while blue and green are constantly spread out in large tracts of sky and sea and foliage. Further, while many

of the rare red objects, blood, fruits, birds, ironstone, minerals, etc., are of practical importance, and while the abundant green objects are present in endless variety of tones, shades and shapes, many of which call for the exercise of discriminatory perception, the widespread blue surfaces of sky and sea are commonly of uniform tone, and in hardly any circumstances is the discrimination of blue tones of practical importance to men of the lower cultures.

Altho the color sense of the ancient Greeks is beyond investigation we can fortunately determine that of other primitive peoples of the present day, most of whom, it is interesting to note, show the same or similar defects in color terminology as those deduced from the ancient writings of the civilized world. Certain tribes of India, for example, have a very definite word for red and a somewhat less definite word for yellow; they have a word for green which may also be used for brown and grey and occasionally for black, but they have no word for brown, violet or light blue. The words they use for light blue are those they use also for green and black. So, too, among other tribes, definite words exist for red and yellow; many words are used to describe green, some of which are applied to blue and black, while violet and brown have no definite names.

Our own Fellow, Dr. William Henry Furness, whose untimely death occurred only so recently, in his book on his life among the Yaps, of that island among the Carolines now subject to international dispute, has this to say of the color vision of the natives of that far away Pacific island:

"It must be indeed a strange world to live in where black, blue, and green are identical in colour; yet apparently it is in such a world that men of Yap live. As far as the colour of their heads and hands is concerned they might as well be Jumblees, 'whose heads,' according to Edward Lear, 'were green and whose hands were blue'; to them such freaks would not be amiss; for all I could make out, the verdant cocoanut frond, the azure sky, and their own dark bodies are all of one color. To them blue and green are only lighter shades of back; the word rungidu is applied to all three."

"One day, to test their perception of colours, I painted squares in my note-book of every colour in my paint box; on asking many men the names of the colours, I learned from the answers of all, that only black, red, yellow, orange and white had distinctive names; all the shades of blue and green were ignored; or, occasionally, they would say a deep blue was the colour of the deep sea, and light green was the color of the young cocoanut leaves, but in the abstract these colors were both rungidu. The carmine was at once picked out as rau; emerald green, ultramarine blue, and black were all rungidu, chrome yellow was rengreng, orange was mogotrul, and white (the black paper) was vetch-vetch; the white foam of the breakers was known as uth."

"They were never at loss in naming or distinguishing the color, and gave such qualifying adjectives as 'moldy' colour; 'dirty' colour; 'close to the color of blood'; the strangest and most poetic was an adjective applied to rose madder, which one man said was a 'lazy' colour. When asked to explain, he replied: 'When a man feels sleepy and lazy and rubs his eyes, he sees this color.'"

"Among women, however, I found that some did recognize blue and green as separate colours, and gave distinctive names to them."

It has been suggested that the deficient sensibility of colored races to blue arises from the stronger pigmentation of the "yellow spot" of the retina, in consequence of which blue and green rays of light are more strongly absorbed on reaching the retina in comparison with red and yellow, and thus a certain insensitivity to blue and green would arise. It is quite likely that this explanation is correct. But we cannot, if we adopt it, attempt to derive defects of color nomenclature

from the same cause, inasmuch as some European languages, as for example, modern Welsh, have no word for blue, or, as in certain parts of Germany, they confuse violet and brown.

Finally we may turn to the color sense of European infants and children in the hope of further additions to our knowledge. Infants from 22 to 60 weeks old have been tested by holding or placing before them pairs of woolen balls or wooden bricks of different colors, and by observing which color is preferred. A reward in the form of a taste of sugar, was given after a ball had been grasped or a brick picked up. Prolonged experiments with colored objects, and with objects painted in various shades of the colorless white-black series, appear to show that at an early age, probably long before the sixth month, infants grasp red and yellow objects in preference to green and blue and colorless, even bright white objects; while blue is at this stage hardly if at all preferred to white objects. Probably at this, and certainly at a somewhat later stage, the infant's preferences are dictated not by brightness but by color. For example a babe, of about the 55th week, was found to grasp a yellow brick far more frequently than a white one, when both were simultaneously exhibited, altho the latter must have appeared brighter to it than the former. On the other hand, a blue brick, altho at first picked up more frequently than a white one, soon lost favor. Thus prolonged experiment showed that blue was at first preferred solely on the score of novelty of color, while yellow was chosen with increased instead of with diminished frequency at successive sittings. The same babe distinctly preferred a brighter to a colorless brick. Consequently the preferences for colored objects at all events at this age, are determined by color, not merely by brightness.

Such experiments, however, afford little evidence of color sensibility. Because a babe picks up blue and grey equally often, or because at an early stage it picks up reds and yellows in preference to greens and blues, we cannot infer that it is color blind, or less sensitive, to greens and blues. It might well be that reds and yellows are more interesting and attractive than greens and blues.

DEVELOPMENT OF COLOR VISION IN THE CHILD.

Darwin first pointed out that the power of distinguishing colors is a very late accomplishment in childhood; he found that his children were unable to name colors correctly at an age when they knew the names of most common objects.

English children of five years of age and upwards have been investigated by the same test as has been applied to primitive people for determining the color thresholds, but the results do not differ from those obtained from English adults as regards their relative sensitivity to red, yellow, and blue. We find no trace of that remarkable deficiency in sensitivity to blue, and slight insensitivity to greenish yellow, which we have found among the adults of colored people. English children have also been tested for color blindness by matching wools, and have been found to make the same confusions in respect to bluish colors as occur among primitive peoples.

We seem justified, then, in concluding that deficient interest in blues and greens is mainly responsible for the defects in color vocabulary and the color matches characteristic of primitive peoples. But we find reason to doubt whether the defective sensibility to blues and greens which exists in primitive peoples can also be attributed to lack of interest in the stimuli concerned, and hence whether with sufficient interest or experience the thresholds would have changed their value. There is no doubt that practice increases the facility of discriminating faint shades of color, just as it is the basis of the education of the tea-taster or the wine expert. It is impossible to foretell the potentialities of the human mind which are undeveloped owing to deficient interest or practice. Under a British teacher, for example,

the Murray Island children proved themselves rather more expert at arithmetic than English children of the same age, but the islanders had no words in their own language, save "one," and, "two," to express numbers.

Is it possible then, that the low threshold for blue is due merely to their accustomed general inattention to this color? The probability is that this explanation is inadequate, for as we have seen English children are similarly unattracted to blue without, however, showing deficient sensitivity to color. We can but conclude that the special insensitivity to blue and to green is due to some special cause, perhaps to pigmentation of the sensory epithelium as has been already suggested.

There is no evidence that man has acquired his color vision say by an early evolution of the red, or blue, sense, later by the appearance of the green, and lastly by the appearance of the blue, or red, sense. Perhaps the earliest condition was one of colorless vision, all objects appearing as shades of homogeneous light. It was only later that the growing experience and needs of the race and of the individual enabled him to differentiate colors one from another, and to distinguish color from colorlessness. We have learned that, tho red and green vision is so unstable in man, red is the most attractive of all colors. No doubt, we have to distinguish between the primary physiologic bases of color vision, and the fullest possible manifestation of their respective functions. The former may have been installed, long before the individual or the race reached the stage when it was capable of appreciating all the various sensations which such an apparatus permitted him to differentiate. That is to say, we have to distinguish the evolution of the upper from the lower systems of that vast unravelled complex, the cerebroretinal apparatus, which is responsible for our color vision.

The materials for this lecture have been gathered in the past five years from various sources, but chiefly the following works, from which I have taken much bodily. My apparent discourtesy in not acknowledging by name the authorship of the paragraphs used will not, I trust, be taken amiss; the facts as set forth are in as simple phrases as it is possible to express what has by now become part of the established body of scientific doctrine.

AUTHORITIES.

Myers, C. S. A Textbook of Experimental Psychology; and An Introduction to Experimental Psychology.
Parsons, J. H. An Introduction to the Study of Color Vision.
Allen, Grant. The Colour Sense. Its Origin and Development. An Essay in Comparative Psychology.

NOTES, CASES AND INSTRUMENTS

THE REPAIR OF CERTAIN CASES OF SYMBLEPHARON ASSOCIATED WITH TRAUMATIC PTERYGIUM.

LEE MASTEN FRANCIS, M.D.,

BUFFALO, N. Y.

Read before the American Academy of Ophthalmology and Oto-Laryngology, October, 1921.

This paper is concerned in certain cases of adhesion between the lid or lids and globe, in which there is also a connective tissue bridge extending to the cornea, forming a traumatic pterygium. Such conditions sometimes follow deep burns of the lids and eyeball, and require operative attack because of impairment of function. Two types are usually encountered, each requiring a somewhat different technic:

A. An adhesion between a lid, usually the lower, and the globe with no involvement of a canthus.

B. An adhesion at a canthus, usually the inner, with involvement of both lids.

Type A:

The method employed is that described by Arlt, and quoted in most text books on ophthalmic surgery, with minor modifications.

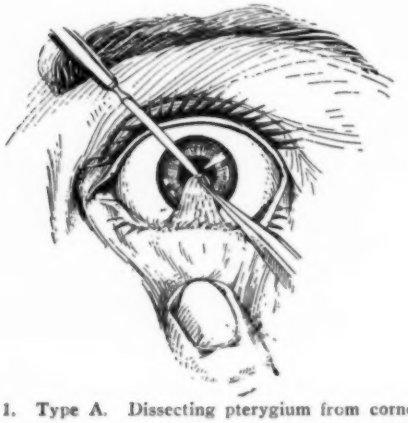

Fig. 1. Type A. Dissecting pterygium from cornea.

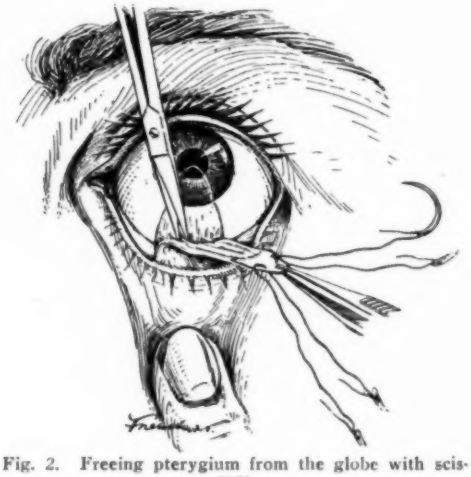

Fig. 2. Freeing pterygium from the globe with scissors.

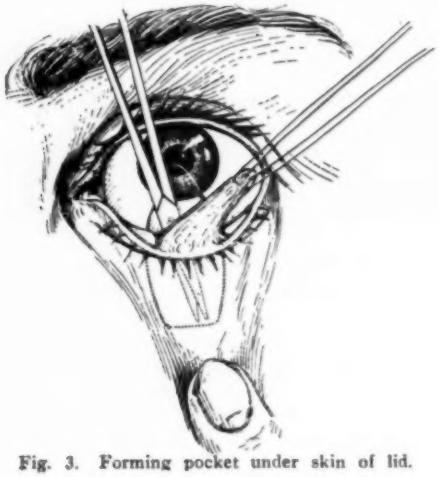

Fig. 3. Forming pocket under skin of lid.

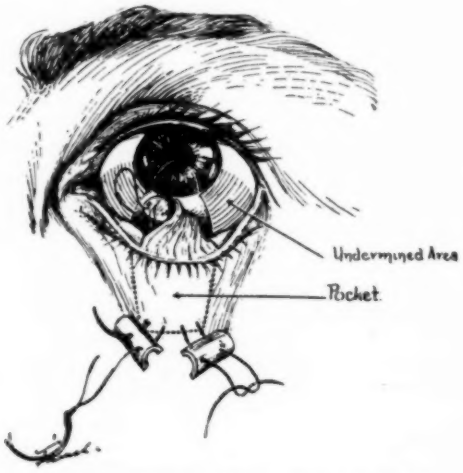

Fig. 4. Sutures brought out thru skin of lid.

1. The pterygium is dissected from the cornea in the usual way with a Graefe knife. Instead of stopping at the limbus, the dissection is continued by the aid of scissors until the entire wedge is freed from the globe down to the fornix. Continuing with the scissors, a sufficiently wide pocket is fashioned under the skin of the lid, well below the level of the fornix. Figs. 1-2-3. It is important to make this pocket deep to minimize subsequent contraction.

2. The under surface of the tongue so formed is thinned by the removal of unnecessary tissue. Double armed sutures are placed in the tip of the pterygium, and the flap is tucked into the depth of the pocket formed. The needles are brought out on the skin surface and tied over sections of small rubber tubing. Fig. 4.

3. The conjunctiva on either side of the denuded bulbar surface is undermined, and brought together by mattress silk sutures. Fig. 5.

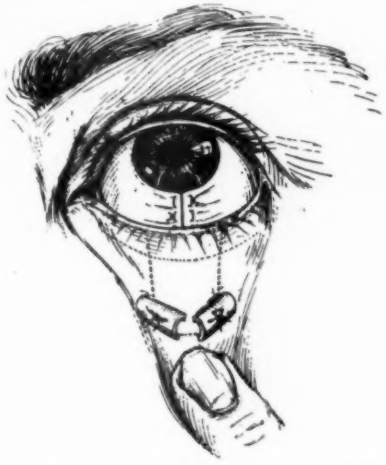

Fig. 5. Conjunctiva brought together with mattres suture.

Fig. 6. Type B. Involving canthus and lids.

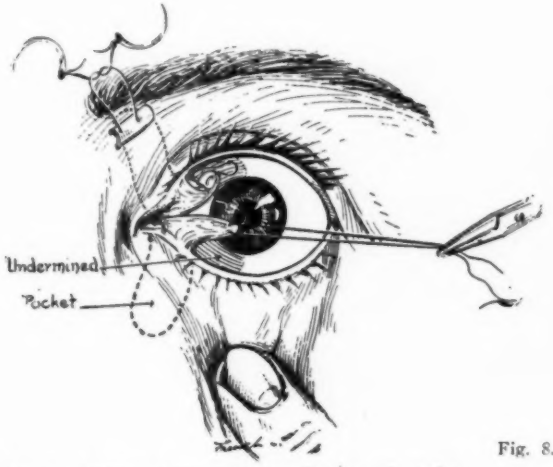

Fig. 7. Sutures placed above. Extent of pocket below.

Fig. 8. Sutures all tied, those thru lids over rubber tubing.

The suture next to the fornix includes episcleral tissue to insure anchorage.

Type B: (involving canthus and lids—Fig. 6).

1. The pterygium is dissected from the cornea and globe as described above.

2. A pocket is fashioned under each lid as described above. Fig. 7.

3. The tongue, having been freed from the adventitious tissue is divided in its long axis, down to the base. Fig. 7.

The upper portion is tucked into the pocket formed in the upper lid, and becomes a partial lining to the lid. The lower portion is similarly transplanted downward into the pocket made below, covering a similar defect in the lining of the lower lid. Fig. 8.

4. The denuded bulbar surface is covered by conjunctival flaps in the manner described. Fig. 8.

The corneal site of the pterygium is curretted in the usual way, atropin instilled and some ointment like White's placed in the conjunctival sac. Both eyes are covered for a few days. The sutures may be removed after the fourth day.

SUBLUXATION OF EYEBALL.

PAUL S. MERTINS, M.D., F.A.C.S.

MONTGOMERY, ALA.

Rarity of the condition is reason for reporting this case. Henry Harold, (col.), aet. 38, shoemaker, called on account of a mild catarrhal conjunctivitis.

Fig. 1. Subluxation of right eye (Mertin's case).

He was six feet tall, well developed, well nourished, and of rather more than average racial intelligence. He had never had previous eye trouble, except snow glare conjunctivitis during the Spanish-American War. His general health was excellent and the shape of his head was good. There was nothing unusual about the expression of his eyes.

On retracting eyelids of right eye with

fingers, to expose the conjunctiva, there was a rather rapid advance of the bulb, until it had passed the strait of the lids. So rapid was the advance that the bulb seemed to fairly pop out of the orbit. Holding the lids open with the fingers the subluxation was easily reduced by pressure on the bulb. There was some blepharospasm and the patient complained of a slight ache in the eye for a few minutes.

Examination of left eye, in like manner, was followed by the same rapid advance of the bulb until it passed the lids.

There was no exophthalmos, tachycardia, tremor, or enlargement of thyroid gland.

Measuring from fixed point of the external bony edge of the orbit, there was noted an advance of six millimeters of the bulb when the patient opened his eyes as wide as possible. Vision in each eye was 20/20 with 0.50 cyl. ax. 90°. Fundus was normal. There was orthophoria. Examination of nose and accessory sinuses was negative.

The accompanying photographs illustrate, to a degree, the extent of subluxation. In making the photographs, care was taken not to let the bulb pass the strait of the lids, on account of the slight pain which was experienced. The photographs illustrate the normal appearance of each eye, as well as the subluxation of bulb, when the lids were retracted.

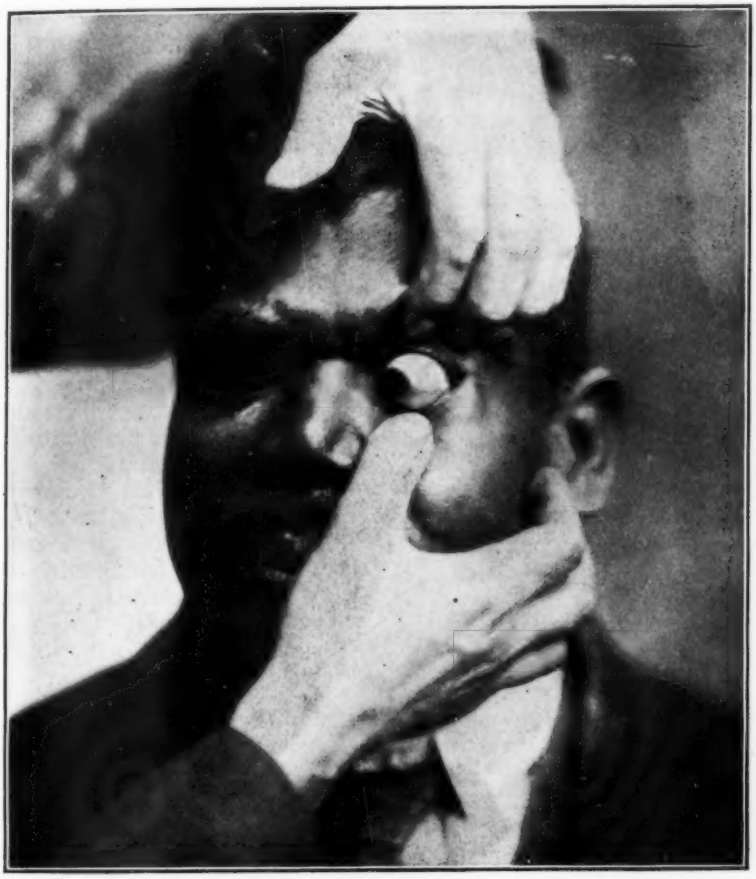

Fig. 2. Subluxation of left eye on retraction of lids.

The patient gave no history of spontaneous luxation of the eye, and was not aware of the anomaly.

T. E. Oertel, (Amer. Jour. Ophth., Series 3, Vol. 3, No. 11), reports a case

of spontaneous luxation of eyeball in a negress. His patient died suddenly, without known cause, and at autopsy, a small cerebellar tumor was found. Her first spontaneous luxation had occurred two months previously; no pathologic condition other than cerebellar tumor was noted.

Oertel reviews the literature from 1900 and finds reports of nine cases, besides his own. Two were insane, one had cerebral gumma, one had exophthalmic goitre, one bilateral exophthalmos without Basedow's disease, and in four cases no mention is made of any pathologic condition.

The suggestion of Levin, quoted by Oertel, of tarsorrhaphy in those cases of frequent spontaneous occurrence seems practical.

NEW KNIFE NEEDLE.

J. E. Hileman, M.D.,

SAN DIEGO, CALIF.

Having had considerable difficulty in getting satisfactory discission needles, I had some made from a special design, which are far superior to anything I have ever used before.

They are fine and delicate, with a special sickle shaped curve, needle point, double cutting edge, very thin blade with no shoulder at heel. The blade being only four millimeters from point to heel, gives great facility for movement in every direction when in the eye, with the advantage of a cutting edge on either side. On account of thinness of blade and lack of obstructing shoulder, its introduction into the eye is made with the greatest of ease and without the loss of aqueous during the manipulation. I am sure if my colleagues will try this needle they will be highly pleased with it.

F. A. Hardy & Co. of Chicago made these needles for me in a superior workmanship manner.

PRIMARY VACCINIA OF THE CORNEA.

Noxon Toomey, M.D.,

SAINT LOUIS, MISSOURI.

The extensive destruction of the cornea and deeper tissues that follows upon the primary inoculation of vaccine lymph into the cornea is so serious, that we believe it should be brought to the attention of the profession. The accidental vaccination of the cornea can often be prevented, if those who handle the virus are mindful of what may result from carelessness. The modern method of marketing vaccine virus in capillary glass tubes favors the accidental inoculation of the cornea. The infecting wound is produced by a splinter of glass flying into an eye of the physician or bystander when one of the ends of the capillary tube is snapped off. That the tube of virus should be held so that flying splinters of glass will not strike an eye, is suggested by common prudence. Furthermore, we urge that no physician should consider himself immune from corneal vaccinia just because he had a successful vaccination a short time before. Even in well vaccinated persons, the virus when inoculated into the cornea is likely to give rise to a slight (anaphylactic) reaction sufficient to cause temporary distress or even slight permanent injury.

A case of vaccinia of the lids, recently seen with Dr. James Moores Ball, led the author to collect the literature on the subject of vaccinia of the ocular apparatus. The case reports in which the cornea was the seat of primary vaccinia are given below. Six of the eight cases were due to glass splinters from vaccine tubes, one to an ivory vaccine point, and one to a needle shot from a mechanical vaccinostyle.

The histopathology of experimental vaccinia of the cornea in animals is very fully discussed by the authors below:

REFERENCES TO VACCINIA.

Wasielewski. Zeit. f. Hygiene u. Inf.-Krankh., 38:212-318. 1901.
Critchett. Medical Examiner, December, 1876.
Eagleton. Ophthalmic Record, N. S., 8:325. 1899.
Doehler. Berl. klin. Woch., 42:250. 1905.
Doehler. Lancet, 1:999. April 7, 1906.
Story. British Medical Jour., 1:346. 1907.
Menzies and Jamison Ibid, 1:198. 1907.
Caillaud. La Clinique Ophtalmolog., Jan. 10, 1913. Abst. in The Ophthalmoscope, 13:150.
Morax. Ann. d'Oculist., 152:345. Nov., 1914. Abst. in Ophthalmic Review, 35:152-153.

SOCIETY PROCEEDINGS

Reports for this department should be sent at the earliest date practicable to Dr. Harry S. Gradle, 22 E. Washington St., Chicago, Illinois. These reports should present briefly the important scientific papers and discussions.

PITTSBURGH OPHTHALMOLOGICAL SOCIETY.

FEBRUARY 13TH, 1922.

DR. STANLEY SMITH, Presiding.

Symblepharon.

DR. E. B. HECKEL exhibited a case of pterygoid symblepharon in an adult following a burn more than a year ago. The patient had followed instructions to stretch the pedicle of tissue by pulling the lower lid away from the globe, so that now there is little or no interference with eye movement. Later, Dr. Heckel will dissect the symblepharon from the globe, unite the edges of the conjunctiva under it and leave the free end of the pedicle to slough off or atrophy. He reports good results from this method, which he has practiced for some years.

Discussion.—DR. E. E. WIBLE is of the opinion that the method is applicable only following superficial burns, and that the symblepharon from a deep burn would not permit of such stretching.

"Prohibition" Amblyopia.

DR. E. B. HECKEL exhibited a case of prohibition (wood alcohol) amblyopia in an adult male negro. Eyegrounds and vision are now practically normal. Treatment was elimination, and strychnia internally.

Discussion.—DR. MEANOR, believes that in true wood alcohol amblyopia vision does not return.

DR. MARKEL had a patient who had taken a gill of wood alcohol, followed with pain in the stomach, nausea and vomiting, and blindness the next morning. There was pallor of the discs. Under eliminative treatment, vision returned to nearly normal.

DR. MCMURRAY had a case of wood alcohol poisoning which went on to optic atrophy with completely white nerves.

DR. SMITH thought Dr. Heckel's case of too fleeting character to be typical of wood alcohol amblyopia. He believes the patient's fundus to be now normal.

Intraocular Tumor.

DR. C. F. BERNATZ reported a case of glioma of the retina in an adult luetic, emphasizing the fact that, in the presence of a four plus Wassermann, we should not be unmindful of etiologic factors other than syphilis. W. D. K., male, aged 53, a dancing teacher, on April 5th, 1921, complained of diminished vision in left eye, with supraorbital headaches and aching of both eyeballs. Family history was negative. Personal history was negative except for the ordinary diseases of childhood and a four plus Wassermann. Patient had been under antiluetic treatment for several years, which included intravenous injections of salvarsan and mercury and iodides by mouth.

External examination showed both eyeballs free from inflammation; pupils responded to light, accommodation and convergence. Response to light was slightly sluggish on left side. Ophthalmoscopic examination showed right eye media clear, no changes in discs, fundus slightly congested. Left eye media clear; detached retina, superior nasal portion, disc good color, arteries and veins normal in caliber. Vision, with glass as worn, was 20/30 in right eye and 20/100 in left eye. Transillumination of left eye showed no shadow present. Vision remained unchanged until August, when vision in left eye failed rapidly and the detachment of the retina increased to a degree which obscured the disc. Transillumination showed no shadow.

On Sept. 20th, 1921, patient suddenly developed severe pain in left eyeball, with headache and vomiting. Examination showed secondary glaucoma, with tension increased to plus three. Transillumination showed darkness in all portions of the eyeball. Glaucoma did not respond to treatment. Blood

pressure was normal. Consultation with another physician brought up the question of differential diagnosis between hemorrhage into eyeball, gumma or tumor formation. Hemorrhage was excluded by ophthalmoscopic examination. To exclude gumma, it was suggested that iodides and mercury be increased to point of tolerance as rapidly as possible. On account of the patient having been on active antiluetic treatment for several years under the supervision of a qualified urologist, it was the writer's opinion that little help could be hoped for from this line of procedure. Feeling confident that a tumor was present in the eyeball, enucleation was suggested as the safest alternative. The patient agreed and eyeball was removed at the earliest possible moment. Laboratory examination revealed the presence of a "glioma" springing from the nasal portion of the retina with beginning metastasis in and around the optic nerve.

Discussion. — Dr. Weisser thought the case unusual from the standpoint of the age of the patient, and that metastasis had occurred so early.

Perforating Wound of Cornea.

Dr. E. E. Wible reported two cases. Case 1, A. G. aged 10 years, was admitted to the hospital within half hour after the accident. An older playmate was attempting to drive a nail, which ricochetted and struck the patient's left eye, causing a vertical laceration of the cornea, about 4 mm. in length, extending downward from the eleven o'clock point. There was no protrusion of the iris. The eye was irrigated, atropin solution instilled and a compress bandage applied. Patient was extremely refractory and on the fourth day there was a prolapse of the iris. An iridectomy was done, and on the following day the entire cornea was opaque. The cornea slowly cleared in about a week, except for a band of infiltration nearly 2 mm. in width along the line of the wound. Patient left the hospital on the twenty-first day. Injured eye, six weeks after the accident, is free from inflammation, and has a faint white cicatricial line at the site of corneal laceration. Pupil is slightly pear shaped and vision is normal.

Case. II. J. S. aged 18 years, was admitted to the hospital with a history of having been struck in the left eye with a long, light hollow stem of a weed which was thrown spear fashion by an associate. There were some abrasions of both lids and a laceration of the cornea in its entire diameter, extending downward from about the eleven o'clock point. Very little reaction from injury ensued, and there was no prolapse of iris. On the third day, opacification of the lens began underneath the line of the corneal wound and slowly extended. It has seemingly stopped at present, leaving a clear segment on the temporal side of about one-sixth of the lens. It has now been seven weeks since the accident, and needling has been deferred until there are indications of arrest of absorbtion of the cataractous lens. There is a rather wide cicatrix resulting from the corneal wound. Comparing the two cases: The first, apparently the more severely injured, with more marked reaction, and intractable patient, no cataract ensuing, a smaller cicatrix of the cornea, and normal vision. In the second case, while the laceration was longer, there was little reaction, patient was tractable, there was no prolapse of iris, cataract ensued.

Traumatic Atrophy of Optic Nerve.

Dr. E. A. Weisser. Mr. M. aged 42, laborer, on Jan. 24, 1922, fell 10 feet from a ladder, striking his head over the left eye, producing a laceration one inch long over the eyebrow and causing loss of speech for twenty minutes. Clinical and X-ray examination revealed no fracture or injury to the eyeballs or sockets. General surgeon's diagnosis was concussion of the brain. Patient claimed immediately that he was pratically blind in the left eye. External examination of the eyes showed both corneae clear, pupil of right eye 3 mm. in diameter and responsive to light, accommodation and convergence; pupil of left eye 5 mm. in diameter, did not respond to direct light, responded to indirect light and to accommodation and convergence. Ophthalmoscopic examination showed media of both eyes clear and fundi negative. On Feb. 2nd, 1922, ophthalmo-

scopic examination showed beginning optic atrophy in left eye. When last seen, about five days later, condition was about the same. Diagnosis is that left optic nerve was injured, either by direct force or by pressure from hemmorrhage into the sheath, somewhere back of the entrance of the central retinal artery but anterior to the chiasm.

Dr. J. C. Markel reported that pathologic examination of the nodules taken from the lobe of the ear of his patient with tumor near the pituitary body, reported at the November, 1921, meeting (A. J. O., Jan. v. 5, p. 41), showed them to be *fibroma of the skin*, with no etiologic relationship, therefore, to the intracranial growth.

George H. Shuman, M.D.,
Secretary.

SAINT LOUIS OPHTHALMIC SOCIETY.

Meeting April 29, 1921.

Dr. A. E. Ewing, Presiding.

Eye Conservation in Industrial Occupations.

Dr. E. H. Higbee read a paper on this subject.

Discussion: Dr. F. E. Woodruff. I desire to call attention to the necessity of determining the vision of men prior to employment. A man comes in with an eye injury. Examination shows that his vision is much impaired, but not in all probability as a result of the injury. But the arbitrator is interested only in the present vision. The attorney for the company asks you, "Did the injury cause that loss of vision?" You may truthfully say "No." But the attorney for the other side says, "What is his vision?", and that vision is the basis upon which the arbitrator adjusts the compensation. It behooves us to try to enforce the determination of vision of men prior to employment so that there may be a record for future reference.

Dr. A. E. Ewing: I cannot understand why it is that the companies themselves do not insist that all prospective employees submit to a visual test prior to employment. If vision is poor, the prospective employe should be informed that it would be best for him to have his eyes examined. This plan would work for the man's own protection.

Dr. Wm. H. Luedde: It is important in certain occupations, to test peripheral as well as central vision. For instance, motormen should, as a matter of course, be examined in that particular, but inquiry at the United Railway office indicates that an examination of the field has never been included as part of the preliminary test.

Dr. E. H. Higbee: Physical examination including visual tests before the man goes to work is absolutely necessary, as is the examination of the fields. In the plant of the American Car & Foundry Company, there are a great many traveling cranes from which depend large hooks which would probably not be seen by a man with a contracted field. Traumatic cataract is and always will be a difficult problem. As a rule, in industrial work, I do not remove a traumatic cataract.

Sympathetic Ophthalmia; Recovery.

Dr. H. S. Hughes presented a case report.

Discussion: Dr. John Green, Jr. I think that there are some cases of sympathetic ophthalmia in which salvarsan is very efficacious. I recall one colored girl we had several years ago at Barnes Hospital, who resisted treatment by mercurials, salicylates and the usual local treatment, who got well rather rapidly after several doses of salvarsan. Dr. Harbridge, of Phoenix, Arizona, has asserted that in cases of sympathetic ophthalmia there will be found some type of focal infection. He believes that sympathetic ophthalmia will not occur in the absence of focal infection. It has been my impression that penetrating wounds of the eyes in children are more dangerous, and more likely to lead to sympathetic diseases, if the child is undernourished, pale and anemic, with adenoids and infected tonsils.

Dr. Wm. F. Hardy: The interesting case of Dr. Hughes brings up three points. One is the treatment that he carried out, which, in my opinion, is

thoroly commendable, namely: saturation with salicylates, and the use of salvarsan and mercurials. The second point is the occurrence of sympathetic ophthalmia after evisceration. I think it much safer to do a clean cut enucleation. I have never been able to convince myself of the superiority of evisceration in securing a better stump, and hence a more mobile and prominent prothesis. The third point is the occurrence of optic neuritis, which was probably a sympathetic optic neuritis and not one due to salvarsan, as suggested by Dr. Hughes.

DR. F. E. WOODRUFF: In these injuries we have not done our duty if we overlook possible foci of infection in the teeth and sinuses. I have come to the conclusion that all cases of sympathetic ophthalmia harbor focal infections. I have seen three cases within the last two years, all presenting focal infections. In no case have I been obliged to remove the offending eye.

DR. W. H. LUEDDE: I was surprised to find that in the War Manual of Ophthalmology, evisceration was offered as the preferred method. The stump after evisceration is of little or no advantage. I have seen two or three cases of sympathetic ophthalmia following eviscerations.

(1) Keloid of Cornea; (2) Transverse Gunshot Wound of Both Orbits, Proliferating Chorioretinitis.

DR. H. D. LAMB presented two case reports. (See p. 253.)

Discussion: DR. JULIUS H. GROSS: A young girl tried to commit suicide by shooting herself in the right temple. The right optic nerve was severed and the left globe was injured from contact with the bullet, producing a ruptured choroid and retina. She retained vision in the lower part of the field of the left eye enough to enable her to go about.

DR. H. D. LAMB. As to the term, "proliferating chorioretinitis," the first mention I found was in the ophthalmoscopic work of Adami. The older text books speak only of "proliferating retinitis"; other authors in speaking of similar appearances give them the name of "plastic choroiditis." Lagrange has attached to it a definite picture and fully explained its pathology. This deep, large, prominent, thick plaque of connective scar tissue has a very characteristic appearance and one can hardly make a mistake in diagnosing it.

JOHN GREEN, JR.,
Editor.

WILLS HOSPITAL OPHTHALMIC SOCIETY.

December 6th, 1921.

DR. BURTON CHANCE, Chairman.

Macular Reflex.

DR. P. N. K. SCHWENK exhibited a case of so called "searchlight" or "policeman's lantern" reflex, at the macula in the left eye of a youth. The left eye in this case was myopic, while the right was emmetropic; the reflex was present in the left eye only.

Myopia With Staphyloma Verum.

DR. BURTON CHANCE showed a case of myopia accompanied by staphyloma verum, in either eye. These cases are rather unusual, and the true bulge in the sclera may be seen and judged by the dip which the retinal vessels take in crossing the edge of the ectasia.

Facial Palsy.

DR. F. C. PARKER presented a case of double Bell's palsy.

Discussion: DR. SCHWENK stated that if the lagophthalmus were peripheral in origin, as it is with a Bell's palsy, we should look in the ear canal for the pathology. DR. ADAMS remarked that if the palsy came on suddenly it must be Bell's, but if slowly it was probably not a Bell's.

Traumatic Cataract.

DR. PARKER also exhibited a case in which an operation for traumatic cataract had been done with a resulting corrected vision of 6/6 in the aphakic eye. It was a question if it would be possible to correct this eye and give the young man binocular vision. When both eyes were corrected, there was a diplopia in all directions of the gaze except straight ahead. Dr. Schwenk thought that it would not be the proper

thing to correct this aphakic eye for the images in the two eyes are of different sizes.

Supernumerary Punctum.

DR. B. CHANCE showed a case of supernumerary punctum and canaliculus in a young Italian girl, who had been under treatment at his clinic, a number of months previously, for the relief of dacryocystitis which he had relieved by extirpation of the lacrimal sac. During the dissection it was noticed that an additional punctum was present in the lower lid, which communicated with the canaliculus by a narrow tube. The canaliculus itself had been slit by another surgeon sometime previous to the child's admission. A probe inserted could enter the canaliculus but not directly the lacrimal sac; there being no communication obtainable into it. The opening of the extra tube was distinctly ciliated and led off at about 4 mm. from the normal punctum; it could readily be perceived when a solution of fluorescein was allowed to flow from the conjunctival sac.

Pigmented Corneal Cicatrix.

DR. B. CHANCE exhibited a young man, in the cornea of whose right eye is a somewhat branching black cicatrix. He had been struck by a piece of rock while working in the mines four years previously. The iris on the nasal side is adherent to a capsulolenticular membranous sheet, which obscures the fundus. This sheet is full of vacuoles or bubbles. As the patient had reported at a late hour his case had not been fully studied, but was exhibited to show the pigmented cicatrix.

Retinochoroidal Sclerosis.

DR. B. CHANCE exhibited a case of extensive retinochoroidal sclerosis in a man about 45, whose sight has been failing for the past 15 or 20 years. He had used glasses with satisfaction for many years, but recently he has not been able to see well, late in the day, so he came with the expectation that his sight might be much improved by new glasses. The visual acuteness equalled 6/20; in the darkened room, 6/30. The peripheral acuteness is greatly lowered; the form fields are contracted and all colors are but feebly perceived, except at fixation. With colored wools he has made prompt and correct selections, and his color sensations are as acute as ever. The fundus of each eye is of a reddish brown tint, due to the absorption of the epithelium and the destruction of the capillary layer with the consequent exposure of the stroma. There are no areas showing complete destruction; the choroidal vessels are everywhere visible, and, at several places near the disc, the walls of the vessels are opaque, causing them to appear like white bands as tho they had been obliterated. A few of the vessels are accompanied by white lines. Here and there clumped and stellate masses of pigment overlie the vessels. The discs are decidedly sclerotic. With lenses correcting a moderate compound presbyopia the acuteness of vision reaches 6/7.5, in each eye, and type 0.50 can be read at a fair range.

Congenital Deformity of Lids.

DR. B. CHANCE showed a man of 60, the skin of whose eyelids is so relaxed that that of the upper lids droops so far as to cover the fissures, while that of the lower sags in great masses. The deformity, which has been present since birth, does not resemble blepharochalasis, nor does it partake of the properties of an inflammatory process, but seems, rather to be the effect of a lack of the elastic fibers of the skin.

C. S. O'BRIEN, Secretary.

COLORADO OPHTHALMOLOGICAL SOCIETY.

January 21, 1922.

DR. F. R. SPENCER Presiding.

Commotio Retinae.

W. C. FINNOFF, Denver, presented a young man who seventy-two hours previously had received on the right side of the face a blow from a fist, immediately followed by marked swelling of lip and cheek and a subconjunc-

tival hemorrhage. Vision of the right eye became dim, and the patient remarked that objects looked purple and their centers punched out. The vision measured 0.06 eccentrically. When the patient was first seen, on January 20, a subconjunctival hemorrhage extended from the limbus to the outer canthus. The media were clear. The upper and lower temporal veins were slightly distended and tortuous. At the fovea was a cherry red spot, in the region of which the retina was slightly paler than normal over an area measuring 1/8 disc diameter. Outside of this pale area was a circular grayish area measuring about 3/4 disc diameter. The center of the disturbed area, outside of the fovea, was slightly elevated.

Discussion: EDWARD JACKSON, Denver. To the temporal side from the macula I noticed a whiter line somewhat concentric with the disc which looked as tho it might approach the character of a rupture of the choroid.

Retinal Detachment.

W. C. FINNOFF, Denver, presented a woman aged sixty-four years, who on December 24, 1921, had noticed that the vision of the left eye was poorer than that of the right. There was no pain or discomfort, and the history was negative as to injury. She had been treated by an optician until examination on December 31, when vision was R. 0.14, L. movements of the hand at twelve inches. The right fundus was negative except for slight kinking of the veins by the arteries. The right vision was normal with correction, the left unimproved. The upper part of the retina of the left eye was displaced forward sixteen to twenty diopters. Just below this area of detachment a part of the disc was visible. Just in front of the disc on the temporal side a thin mass of exudate obscured the vessels. The whole periphery of the retina was displaced forward, the temporal portion being very white and opaque and thrown into irregular folds, whereas on the nasal side the pink fundus reflex was visible thru the retina. The tension was normal, and transillumination, Wassermann, and urine tests were negative, as were the nasal sinuses and teeth. The systolic blood pressure was 150 mm. There had been no change since the original examination.

Steel in Posterior Ocular Wall.

W. A. SEDWICK, Denver, presented a man aged thirty-two years who had come on account of blurred vision in the right eye and a sensation of scratching in the eye, of variable location. Two years previously, while he was picking down rock in a silver mine, something had blown into the eye. There had been an inflammatory reaction of four days duration, but the vision had recovered from the initial disturbance and he had continued work. A few weeks later the vision again failed, and the patient was bothered by streaks before the eye. The more recent disturbances had begun about one month ago. The vision was R. 6/100, L. (with correction) 15/20. The right iris was a good deal discolored, and showed a wound between seven and eight o'clock, corresponding to a very small corneal scar. The lens was cataractous. X-ray localization showed a small foreign body downward and to the nasal side near the optic disc, probably lodged in the coats of the eyeball. It was suggested that an attempt to remove the foreign body was not advisable, and that enucleation of the eyeball was not at present called for, but that the cataract should be extracted later.

Discussion: H. R. STILWILL, Denver, thought there was no object in trying to remove the piece of steel, the velocity having probably been reduced sufficiently by its passage thru the front of the eye to make it improbable that it would have retained sufficient momentum to enter the posterior coats.

W. C. BANE, Denver. Dr. Sedwick and I made a test with the sideroscope, but the result was not positive. The foreign body is by this time encysted. We do not know that it is magnetizable. I think it unwise to attempt removal of the fragment so long as the eye remains quiet. If the fragment is

encysted, you could not hope to get it out with the magnet, and would probably do a good deal of damage in the attempt.

C. E. WALKER, Denver, referred to a case in which the fragment had stayed in the sclera for about twenty years without damage to the eye; and thought that if the X-ray indicated that the splinter was in the sclera it would be well to leave it alone.

MELVILLE BLACK, Denver, favored leaving the eye alone until more marked symptoms developed. He did not believe there was danger of sympathetic inflammation occurring in the other eye without preceding attacks in the injured eye.

Traumatic Cataract From BB Shot.

W. C. and W. M. BANE, Denver, presented a youth aged eighteen years whose left eye had on January 2, 1922, been struck by a BB shot from an air gun. On that date vision was of hand movements. There was a slight abrasion of the cornea, and there were three mm. of blood in the lower angle of the anterior chamber. Next day the vision was 5/60—. On the third day most of the blood in the anterior chamber had been absorbed but there was a stellate figure in the posterior cortex. Now, nineteen days after the injury, the opacity had greatly cleared, and the fundus reflex was seen thru a web like opacity. The vision was 5/30 with plus 3.50 sphere. Atropin and dionin had been used locally.

Discussion: W. H. CRISP, Denver, thought the condition of the lens was likely to remain pretty much as it was.

Opaque Nerve Fibers.

F. R. SPENCER and C. L. LA RUE, Boulder, presented two striking cases of opaque nerve fibers, in women college students, aged nineteen years, each of whom had come on account of refractive strain. In the one case each eye presented an opacity extending in all directions, but irregularly, from the margin of the optic disc; while in the other the left eye only was affected, and the optic nerve fibers extended upward and downward from the disc margin.

Lacerated Injury From Gunpowder Explosion.

W. F. MATSON, Denver, presented a youth, aged nineteen years, who on July 2, 1919, had received an injury in the left eye caused by a blow from a baking powder can, which he had filled with gunpowder, touching it off with a fuse at a distance of fifteen feet. There had been a small corneal tear and iridodialysis below. The eye had quieted down under ordinary treatment, and so remained. The lens capsule had been ruptured, and the lens had been gradually absorbed, without hypertension. Was it advisable to open up the opaque lens capsule?

Discussion: Opinions were expressed in favor of leaving the eye alone.

Papillitis, Brain Tumor or Albuminuric Retinitis?

E. E. MCKEOWN, Denver, presented a man aged forty-one years who had come complaining of headache and double vision. Some time ago he had had influenza, from which he had not made a good recovery. In October, 1921, he had fallen eight feet from a loft to a board floor. After the fall he had been irrational for four hours. He had seemed all right after the injury, except that his neck got stiff and he a continual headache. About six weeks after the injury he developed an aphasia and some numbness in the right hand. He stated that about December 1 some drops had been put into his eye by an eye specialist, and that he had seen double ever since. Another physician had made a diagnosis of Bright's disease and uremia. Each fundus showed a choked disc of about three diopters, with a fairly pronounced congestion of the retina. There were five or six small hemorrhages, probably rather old, in the left eye, and one very small hemorrhage in the right. The vessels were not tortuous. There were no spots of exudate. A number of polypi had been removed from each side of the nose, and the ethmoids and sphenoids had been opened at the same time. Wassermann test was negative for the blood, mildly positive for the spinal fluid. An X-ray

examination of the skull was practically negative. The vision of each eye was 20/30, and the visual fields were normal. The patient had been given one dose of arsphenamin.

Discussion: MELVILLE BLACK, Denver, thought that the diagnosis was more probably albuminuric retinitis than brain tumor.

EDWARD JACKSON, Denver, thought that the history pointed to the presence of syphilis, and that the recent details suggested that the diagnosis lay between syphilis and injury to the optic foramen at the time of the fall. There was nothing typical of syphilis in the neuroretinitis, but taking the history and positive Wassermann he thought it was likely that injury had been complicated by the presence of syphilis.

W. C. FINNOFF, Denver. I recently had a very puzzling case at the county hospital. There was a frank albuminuric neuroretinitis, with snowbanks around the macula, the nerve swollen, albumin and casts in the urine, but hemiplegia on the right side, with no other signs. The neurologist's diagnosis was uremic hemiplegia. A few days later the patient choked to death. At postmortem a large tumor was found on the right side of the brain. The kidneys were decidedly contracted, that is there was advanced kidney disease as well as a brain tumor.

F. R. SPENCER, Boulder. It is quite possible that the albuminuric condition is due to the polyps. Keiper has reported a number of cases of this kind.

WM. H. CRISP,
Secretary.

NASHVILLE ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY.

DR. HILLIARD WOOD, President.

January 16, 1922.

Specific Keratitis.

DR. J. J. FREY exhibited Mrs. A. B. aet. 25, who first consulted him August, 1920 complaining of failing vision in each eye. Her family history was negative. Personal health had been good until 18 months previously, when she contracted lues. Examination showed vision P.L. each eye. Marked keratoiritis, with posterior synechiae each eye. Blood Wassermann plus 4. Family physician began administering salvarsan, giving one injection every two weeks until 12 doses had been given. Atropin solution instilled in each eye. No improvement in condition of either eye until Dr. Frey began subconjunctival injections (usually 10 minums) of 1/2% solution mercury cyanid combined with salt, September 15, 1920. These were given at intervals of three weeks until seven doses had been administered. The keratoiritis immediately began to subside. Vision at present: R.E. 20/100; L.E. 20/50. During the treatment a tonsillectomy was done on this patient. Feb. 19, 1921 patient resumed regular duties.

Discussion.—DR. W. G. KENNON regards subconjunctival injection of cyanid of mercury, in these acute cases, as being of doubtful benefit, as it is the natural tendency of such cases to improve under antiluetic treatment. He has used it with rather indifferent results. He does not think it has any hastening effect upon the process of clearing up. He reported having used it on one eye in a case of double keratitis, and the case did clear up remarkably well. But the clearing up in the fellow eye was just as slow, and just as complete, as in the eye given the injection.

DR. EUGENE ORR questions the advisability of using such a strong solution of mercury cyanid, stating that the strongest solution he uses is 1/2 grain to one ounce. He asked whether novocain or dionin was added to the solution; also whether Dr. Frey did not have to keep the patient under morphia to control the pain.

DR. E. B. CAYCE said that he had been very much interested in the work of Dr. E. L. Jones, who has done so much to standardize subconjunctival injections, and whose experience bears out the statement of Dr. Kennon, i.e., that it is not so much the specific drug which accomplishes a beneficial result as it is the reaction of the tissues. Dr. Jones' formula is 1-2000 of cyanid of mercury and he advises that 2 cc. be in-

jected. Dr. Cayce believes that in such cases the iodides should be given in massive doses, and pushed to a point even beyond that which is ordinarily understood as iodism.

DR. ROBERT SULLIVAN thought the absence of severe pain rather remarkable. He said that it was his custom to inject 2 cc. of the solution, 1-2000 with 1/4 grain morphia, dionin and novocain, and occasionally bicarbonat of soda; and even then it is almost impossible to quiet the patient without an additional hypodermic.

DR. HILLIARD WOOD considered the striking feature about this keratitis to be that it followed acquired lues. While the condition is, of course, quite common in children with hereditary lues, yet he has seen only one case, possibly two at the outside, of interstitial keratitis following acquired lues in an adult. He was especially interested in the effect of the cyanid of mercury injected subconjunctivally in this type of cases, believing that theoretically the treatment is good, and certainly worthy of further study.

Chronic Choroiditis.

DR. E. B. CAYCE: Miss N. M. aet. 23 first consulted him January 12, 1921 with a history of influenza two years previously, followed by failing vision in the left eye. For the past two or three months has had pain in each eye, gradually growing worse. Examination showed R.E.V. = 20/15; L.E.V. = 20/200, not improved by glasses. Left eye: Large patch of choroiditis in region of macula; fresh hemorrhages towards disc margin. Right fundus beginning to show some new changes. Nasal septum deviated to the right, with spur on right side. Faucial tonsils enlarged and septic. Referred to Dr. J. P. Keller for general examination. Dr. Cayce advised tonsillectomy.

Discussion.—DR. HERSCHEL ESELL stated that in his opinion the all important feature in this case is the visual result. He unhesitatingly advised tonsillectomy. His experience has been that following tonsillectomy the voice is as good, if not better, than before operation. Drs. M. M. CULLOM, and E. L. ROBERTS expressed similar opinions.

MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY.

January 10th, 1922.

Uveitis, Vitreous Opacities.

DR. J. A. HUGHES, presented the case of Miss Thelma W. age 16, white, school girl.

Came to me January 9th, 1922, complaining of poor vision and some pain in right eye, with the following history: One week after having read for several hours, she noticed some pain in right eye, and that there seemed to be a scum or something in her eye, and she placed her hand over left eye and found she could not see very much with right eye. Has never had any trouble with her eyes before, and has never had them examined or worn glasses. Has had frequent attacks of tonsillitis, and all the diseases of childhood.

On examination I found the pupil of right eye slightly dilated; but it reacted to light fairly well, and was perfectly symmetric. Conjunctiva slightly inflamed, but no mucus or pus in the sac. Tension with McLean's tonometer 24. Vision O.D. 10/200, O.S. 20/70. Ophthalmoscopic examination revealed the media so dense you can hardly see the vessels; cannot outline the fundus at all. Some small vitreous opacities can be seen. The anterior chamber is very deep, and any amount of small dot like deposits upon the posterior surface of the cornea. Diagnosis, Punctate keratitis. Patient also has some hypertrophied tonsils.

Discussion.—DR. J. B. STANFORD thinks that all points of focal infection should be cleared up.

DR. HUGHES thinks that the tonsils should be removed in this case. He also asks about refraction to relieve eyestrain, and also how long should atropin be kept up.

Subhyaloid Hemorrhage.

DR. LOUIS LEVY presented Fred Bailey, age 41, occupation farmer. First seen July 15, 1921 in the medical clinic, complaining of having had a stroke of paralysis December, 1920.

Family history negative. Positive venereal history. Paralysis came on

while working. Had positive blood test at Hot Springs where he took some treatments.

Physical examination July 15, 1921, hypertrophied heart, accentuated second sound. Blood pressure, systolic 155, diastolic 80. Wassermann ordered. July 20, Wassermann was reported negative. The specific treatment was continued. Urine report showed positive albumin with negative microscopic examination.

From July 20th on to Nov. 2nd he continued to improve slowly, gradually getting better use of his muscles. On this date he complained that he had a skin over his right eye and was sent to the Ophthalmic clinic for examination. His chief complaint was the film and speck over right eye for past two days. Vision, O.D., 20/25; O.S. 20/25.

External examination negative except for prominent eyeballs. Ophthalmoscopic examination, right eye, media clear. Large disc shaped hemorrhage, one disc diameter above the disc, which seems to be anterior to the retinal vessels and has the appearance of a subhyaloid hemorrhage. Blood vessels tortuous. Veins dilated. Increased light streak in the arteries, crossing phenomena marked. There are a few small round hemorrhages in the periphery of the fundus on the nasal side. Left eye, the fundus picture similar to the right, except that there was no large hemorrhage. A Wassermann and urinalysis were ordered and the patient told to return for further study of the fundus. The next day the urine was reported negative and the Wassermann 4+.

The neurologic examination at this time revealed weakness of the entire right side of body, also hypertrophy of the heart; mitral, systolic and presystolic murmurs. The neurologist's opinion was that it was a cortical hemiplegia. Origin probably embolic from rheumatic endocardial origin, and not luetic. He thinks that the retinal hemorrhage is luetic.

Since that time he has been given two doses of arsenobenzol. On July 7th, the ophthalmoscopic examination showed the hemorrhage much smaller in size than it was on previous examination. It is now situated directly above the disc, in front of the retinal vessels, and conforms to the shape of the disc in outline below. Above, at the old site of the hemorrhage, are irregular spots, probably due to absorption.

Jan. 10th. The appearance is the same as on previous day.

Uveitis.

Dr. J. W. Ramsey presented the case of Mr. L. Y., age 27, school teacher, first seen on November 26, 1921, who gave the following history: Eight years ago the vision of the right eye became very much impaired. The vision cleared up except that, as he expressed it, there remained a spot which he could not see thru but could see around. On the first day he was seen by me, the vision was again impaired, this spot had become larger and the eye was very painful.

Examination showed vision O.D. shadows; O.S. 20/50. Ophthalmoscope showed the vitreous O.D. very cloudy and containing very large, black looking, floating opacities. The fundus could not be seen. There is a disseminated choroiditis in the left eye. The iris. O.D. was inflamed. Wassermann negative. Family history and personal history negative. Examination of nasal sinuses negative. Tonsils infected and were removed; with the local eye treatment of atropin, etc., the patient has had potassium iodid internally. But in spite of the treatment the eye has become worse, except for the relief of the pain, and there has developed the keratitis which is now seen.

Discussion.—Dr. E. C. Ellett says that the case is one of uveitis, and has become chronic and hopeless. The prognosis depends upon the location of the opacities in these cases.

Dr. Ramsey feels that the case is hopeless. He asks if injections of sterile milk will help. Dr. Ellett answered that sterile milk will help only in pyogenic infection.

Gunshot Wound of Both Eyes.

Dr. J. B. Blue reported E. H. while out hunting Dec. 27th, 1921 was shot in face with No. 7 bird shot. He was about 20 steps from gunner at the time. Admitted to hospital Jan. 3rd, 1922. At

this time condition as follows:

O.D.—Skin about eye ecchymotic, conjunctiva blood stained, pupil dilated (has been using atropin). Cornea and lens clear. No fundus reflex from lower portion of eye. Reflex above, but details not outlined. Vision, fingers at about 10 feet.

O.S. Lids much smaller, ecchymotic; conjunctiva chemotic and portion protruding between lids. Cornea clear; wound of entrance of shot in midline about 1 mm. above sclero-corneal margin. Iris protrusion. No fundus reflex. Eye movements very limited. There has been no pain at any time.

Discussion.—Dr. E. C. Ellett says that the outlook is bad where there is a perforation of the orbit. Treat with atropin and rest and if iridocyclitis does not subside, enucleate.

Dr. Stanford thinks that the left eye should be enucleated.

Optic Atrophy and Papillitis.

Dr. J. B. Blue presented H. G. who was struck on head Dec. 13, 1921. Admitted to hospital Dec. 21, 1921, eight days later. Examination at this time showed:—

O.D.—Lids smaller, ecchymotic; conjunctiva stained by blood pigment. Marked exophthalmus. Pupil moderately dilated, does not react directly to light. Reacts consenually. Media clear. Disc well outlined, pale. Small hemorrhages. No light perception.

O.S.—No exophthalmus, pupil moderately dilated, reacts to light. Media clear. Disc not able to be outlined, swollen. Numerous whitish spots about fundus. Vision fingers at 8 in.

Present Condition—O.D. Exophthalmus gone, no vision, disc white, vessels small.

O.S. Papilledema has diminished. Vision, fingers at 15 ft.

Discussion.—Dr. E. C. Ellett said that the eye grounds seem to show more of an albuminuric than traumatic appearance.

Glaucoma Operation.

Dr. J. B. Blue reported on H. W., on whose right eye an Elliot trephine operation for glaucoma had been done, and on whose left eye iridectomy.

O.D.—Operated upon last summer still has about as much vision now as before operation. Before operation vision was failing very fast. O.S.—Blind when admitted to hospital, operation done for relief of pain. This was successful for a while. Patient is now back for treatment on account of pain.

Double Chronic Glaucoma with Cataract.

Dr. A. C. Lewis presented Mrs. H. B. aged 69 who was sent from Mississippi on Dec. 30th, 1921 for cataract operation.

History: Has been practically blind in left eye for 14 years. Vision in right eye rapidly failing for a year. Dull pain has attended the loss of vision in each eye.

Examination: Corneas clear, pupils widely dilated, right lens very cloudy, left lens white and opaque.

Vision O.D.—counts fingers at 2 feet, in good light. O.S.—light perception only. Tension, O.D. 75, O.S. 90. McLean.

Dec. 31st—O.D.—Iridectomy done with the 3 cut method as employed by Reese.

O.S. Elliot trephine operation done.

Jan. 9th. Tension—O.D. 40, O.S. 15. (McLean).

Cataract extraction will be done on both eyes this week and a final report on the case made later.

Discussion.—Dr. J. B. Stanford could not elicit light perception in the right eye. The cataract operation is questionable.

Orbital Abscess.

Dr. G. H. Savage reported that on Nov. 30, 1921, Mr. M. F. H. age 37, was brought him for trouble of right eye. He gave a history of having had neuritis in neck, back and arms for past several years. This he attributes to a spondylitis due to being injured in a street car wreck. For about six weeks, previous to a week or two before coming, he had been in bed suffering from pain in back, neck and head. The history in regard to the eye is that three days before he had noticed the right eye was a little red and pained him just a little. Previous to this, he had never had any

trouble with his eyes. He said the eye ran water, the light was a little painful but there had been no pus. Had gotten no lick or injury of any kind to set up any trouble.

Examination of right eye showed vision 20/100. Very slight chemosis of conjunctiva at corneo-scleral junction. Slight redness of conjunctiva, lids swollen, pupils small and fixed. Tension, with fingers, normal. Very little pain in eye, but a great deal in top of head and in temples. Aqueous cloudy and could not make out fundus. Diagnosis at this first visit was iritis; treatment atropin and hot applications.

Dec. 1, 1921, eye worse. V. light and hand moving few inches away from eye. No change in external appearance. Pupil hardly semidilated. Continue atropin and hot applications.

Dec. 2, 1921. Eye much worse. Chemosis very marked with protrusion of conjunctiva at inner canthus. Slight exophthalmus. Vision light perception, complaint of intense pain in side and top of head, not so much in eye. Had been unable to sleep the previous night. Sent to Baptist Hospital with orders to have X-ray of sinuses and teeth made. The patient had never had any nasal or sinus trouble and the examination of nose was negative.

Dec. 3, 1921 Dr. E. C. Ellett saw him in consultation. He thought possibly some frontal sinus trouble was the cause of the patient's condition, which was about the same, except the exophthalmus was more pronounced, down and outward. The X-ray showed very slight if any involvement of frontal sinuses or ethmoids. Teeth negative as to abscess. Dr. Bethea who made X-ray examination thought the slight cloudiness of right frontal was probably due to the swelling in the lids and orbital tissues.

Dec. 4, 1921. Eye unchanged.

Dec. 5, 1921. Lids seemed to move more easily, otherwise eye the same.

Dec. 6, 1921. Seen again by Dr. Ellett who thought as I did, that an exploratory operation, at least, was justifiable. The symptoms, pain, exophthalmus and chemosis were more marked. Vision nil. Cornea dull and hazy, pupillary opening appeared slightly yellowish.

Dec. 7, 1921. Dr. Shea helping, opened the right frontal as tho going to do a radical operation, but found the sinus healthy. I then enucleated the eye. After making the circumcorneal incision thru the conjunctiva, I introduced a pair of curved scissors to free adhesions and on opening them a large quantity of thick pus was evacuated from upper and inner quadrant. The eyeball was opened during the operation and after its removal it appeared to be partially filled with pus. The incision in brow was closed and eye dressed. The patient was seen daily and eye dressed. Stitches removed on the 12th, patient doing well. Left hospital on 14th.

Dec. 16, 1921. Wound in brow opened and bloody pus evacuated.

Dec. 17, 1921. Wound closed, very little discharge.

Dec. 18, 1921. Lid wound closed, healed firmly without any more discharge, and patient went on to good recovery.

January 9th, 1922. Given an artificial eye, fairly good effect.

Discussion. — Dr. E. C. Ellett thought it peculiar that the patient had no fever. Another peculiar thing was the involvement of the orbital tissues and the eye at the same time.

Dr. W. L. Simpson asked about the source of the infection. He thought it possibly due to ethmoid involvement with a small perforation, occurring perhaps weeks previously.

Chronic Glaucoma.

Dr. Louis Levy presented W. W., age 45, who first presented himself with the following complaint: Cannot see out of right eye at all and only dimly out of left. Present trouble began six years ago, following a blow on the right eye with a stick while chopping timber. The vision gradually went out of the right eye, but the left was not involved at this time. Four years later the left began to give trouble and has been gradually getting worse. Says he sees best on the "outside part" of his eye. Vision, right eye, not even light perception; left eye 20/200.

External examination: Right eye, numerous anterior and posterior synechias. Lens absorbed except for a small piece of capsule in pupillary space. Left eye, pupil 3 mm. fixed. Complete posterior synechia. Lens clear.

Ophthalmic examination: Could not

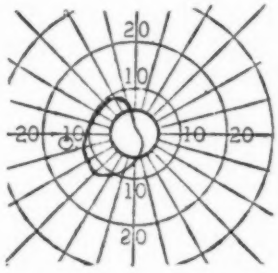

Fig. 1. Field of vision in glaucoma, Levy's case, before operation.

see fundus of either eye. Tension, right eye, too soft and would not record on instrument. Left eye, Schiötz 67. Field of vision shows marked contraction for form and color, leaving only a small

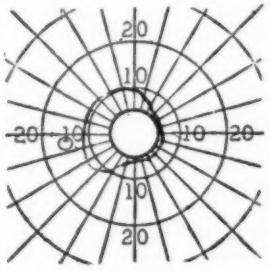

Fig. 2. Field after operation, left eye.

island of vision between 5 and 10 degrees. Immediate operation was advised.

Dec. 31, 1921. When seen at the hospital pupil had dilated somewhat and was about 5 mm., due to instillation of atropin. Operation: The conjunctival flap was made, a broad iridectomy performed and a sterile dressing applied.

Jan. 1, 1922. Dressing removed after 24 hours. Eye clean. Washed out with boric acid, one drop of 1% solution of atropin instilled. Dressing applied.

Jan. 2, 1922. Eye improving. Eye seems softer than before. Pupil well dilated from atropin. Eye washed with boric and dressing reapplied.

Jan. 4, 1922. Eserin sulphat, grs. 2 to 1 ounce of water three times a day in eye ordered.

Jan. 5, 1922. Conjunctival sutures removed. Patient discharged from the hospital.

Jan. 7, 1922. Tension, Schiötz 20. Eye very much improved. Discontinue eserin, continue heat and eye wash.

Jan. 9, 1922. Eye very much improved. Fundus of left eye can now be seen. It shows a deep cup, which involves almost the entire disc, except a very small part of periphery. Blood vessels well dilated. Vision with —2. sphere 20/100. Field of vision again taken and is about the same.

Jan. 10, 1922. Field of vision about the same as when first seen. With a —2.50 sphere ⌒ —0.25 cylinder axis 45°, patient sees 20/70.

Dr. S. S. Evans,
Secretary.

COLLEGE OF PHYSICIANS OF PHILADELPHIA, SECTION ON OPHTHALMOLOGY.

November 17, 1921.

Dr. G. Oram Ring, Chairman.

Avulsion of Optic Nerve.

Dr. B. F. Baer, Jr. exhibited a young man, who in May, 1914, was shot in the right temple with a bullet from a "32" calibre revolver. The bullet passed across the right orbit directly back of the right eye, thru the nares and the left orbit. Immediate blindness of both eyes, ptosis of the left upper lid and paralysis of the superior rectus muscle on the left side occurred. The blindness in the right eye has remained permanent. Five months after the injury, vision had so far improved in the left eye, that large objects were discernible, the patient stating at that time he could recognize individuals but was unable to read print. In the spring of 1919, he was struck in the left eye with a piece of wood, as a result of which a traumatic cataract developed. In the fall of 1919, a Tansley-Hunt operation was performed on the left up-

per lid with good effect, and at a later date, an attempt was made to remove the cataract.

Present condition. Right eye. Pupil widely dilated and nonreactive. A few fine vitreous opacities. At the posterior pole of the eye is a whitish area, irregularly round and about three times the normal disc in size. This area is completely ringed by a band of choroidal pigment. Superimposed in the center of the whitish area, is a mass of proliferating retinal tissue in which are a number of small adventitious vessels. The entire periphery of the fundus shows widespread disturbance of the choroidal pigment. The retinal veins are greatly contracted, and can be traced to the edge of the whitish area. The retinal arteries are absent.

The left eye presents a narrow, upward coloboma (operative) and the pupil space is filled with a thick secondary membrane, thru which no view of the fundus or fundus reflex is obtained. Vision in this eye is light perception in the temporal field only.

Discussion.—Dr. Wm. Zentmayer stated that he had exhibited the patient before the Section in 1919 with a diagnosis of avulsion of the optic nerve. The fundus of the right eye was little changed since then. The lesions present are largely those due to proliferative retinochoroiditis such as was frequently observed in France during the war. In the left eye an iridectomy has since been made with the hope of improving the vision which at the time of the operation was L. P. The patient now has form vision.

Exhibition of a Muscle Indicator.

Dr. Edwin B. Miller (by invitation) exhibited and described a device for the purpose of simplifying the study of the ocular muscles, and especially to visualize the exact position of the muscle in action in plotting the diplopia field and to pick out the faulty muscle in the search for the cause of the various forms of muscle imbalance. It is based on the classification of Duane. The indicator consists of two wooden tongue depressors nailed together to form the letter T, and several pieces of cardboard mounted on pins, to represent the midsection of an eye, and several to represent the true and false images, with two red arrows which point out the direction of the diplopia, the direction of the separation of the true and false image, the direction of the limitation of movement of the eyeball, and the location of the paralyzed muscle. On the central portion of the horizontal bar, there are four pieces of cardboard mounted on pins, two black, that represent the true and two red that represent the false image, in disturbance of the lateral turners. On the ends there are two larger cards on which there is a diagram showing the position of the true and false images in paralysis of the elevators or depressors. The patient is examined in a dark room. The operator, standing about ten feet in front with a candle or small electric lamp to elicit the diplopia, determines the position of the double images. The indicator is held face up, and the red arrow is turned in the direction of the false image, as shown on the horizontal arm. The examiner now reads off the various symptoms indicated and determines the affected muscle.

Discussion.—Dr. Luther C. Peter. As Dr. Miller has pointed out the indicator is an aid in checking up the correctness of the diagnosis as to which individual muscle or muscles are paralyzed. He has not included in the mechanical device all the data which this indicator will truthfully represent if the scheme is slightly modified, as he has omitted in his paper vicarious rotations of the head. The face rotations should be clearly and definitely separated from the tipping of the head to the right or left shoulder. The tipping of the head to the right or left shoulder is more in the correction of the obliquity of the false image than in the correction of the vertical diplopia. The face rotations are an effort on the part of the patient to bring the binocular vision in the field of least diplopia, or to place the eyes in such a position that the paralytic muscle operates but little, if any, and the diplopia may even disappear. Dr. Peter thought that the phrase generally used in tabulating ocular muscle palsies which states, "in the direction of the physiologic action of the paralyzed

muscle" or "opposite to the physiologic action of the muscle" should have added "with the eyes in the primary position."

Embolism of Central Retinal Artery.

Dr. Charles E. G. Shannon exhibited a male patient, giving the history of a sudden loss of sight in the right eye. Four days following the attack of sudden blindness, examination revealed loss of light perception, pupil moderately dilated and sluggish in reaction; disc hazy and pale, margins obscure, arteries contracted and a large ill defined whitish patch in the macular region, with a small hemorrhage to the temporal side. No cherry red spot.

Enlarged and diseased tonsils were found and removed. No evidence of cardiovascular disease. Wassermann, blood and spinal fluid negative; urinalysis negative; X-ray of teeth, sinuses and head negative; von Pirquet negative. Within four or five days, there was a slight restoration of vision, which reached 8/200 eccentric fixation. There was an absolute central scotoma which still persists.

Treatment consisted of iodides and deep massage. Endarteritis proliferans should be considered as a possible diagnosis, as no discoverable lesion was found. In view of the sudden and complete loss of vision, the pallor of the disc, contraction of the arteries, and opacity of the retina, a diagnosis of embolism appeared proper.

Obstruction of Central Artery of the Retina From an Unusual Cause.

Dr. George H. Cross reported the case of a man, aged 29, a watchmaker, who on arising April 24, 1921, discovered that the right eye was almost completely blind. Nothing unusual or out of the ordinary happened the day or week before this occurrence.

Examination: Ophthalmoscope, O.D. media clear, pupillary reaction very sluggish, disc margins obliterated, veins reduced in caliber, the larger arteries reduced to a thread; this condition prevailed thruout the fundus, which was anemic with marked paleness of the outer half. Macula stands out prominently as a cherry-red spot. In the lower center of the fundus is a large, irregular, pale, greenish-white area with a heavier border on the lower margin, quite typical of the condition described by de Schweinitz, quoting Coats' as ischemic necrosis. There were numerous tuft like hemorrhages in the central fundus, and there was noted on some of the arteries a marked periarteritis. Wassermann was negative to four antigens. A blood culture showed no growth; white blood count showed 12,000 leucocytes, polymorphonuclears —65%, lymphocyctes—31%, large mononuclears — 1%, eosinophiles — 3%. Urinalysis showed nothing unusual. Repeated examination revealed a gradually increasing cloudiness of the vitreous, until all details of the fundus were obscured. On the 5th month, 16th, a large area of punctate deposits in the lower third of the cornea were noted in conjunction with a thin ring like exudate on the posterior lens capsule.

June 15, 1921. Patient can now count fingers, cornea again clear, media permitting a view of the fundus; vision equals counting fingers peripherally. X-ray examination of the teeth showed no pus pockets, or areas of absorption. Sept. 27, 1921, vision in right eye 15/70—vision in the left eye which was unaffected = 15/15.

Causative Factor. For three months prior to the sudden loss of vision, this man had a bone felon on the right thumb, which persisted in discharging purulent material until a large sequestrum of dead bone was removed, this taking place after the ocular changes had developed. Inasmuch as the eye condition denoted an infective process and a physical examination revealed no other possible cause, it was decided that this obstruction of the central artery of the retina was in all probability due to a septic embolus.

Composite Astigmatic Chart.

Dr. Luther C. Peter exhibited an astigmatic chart which he had modified from that suggested by Dr. Walter B. Lancaster. The chart is made of standard wedding stock cardboard and a narrow black velvet baby ribbon, and has a diameter of 15 inches constructed on 15 degree intervals. Instead of pasting the ribbon on the cardboard, as suggested by Dr. Lancaster, it is passed thru small openings at both ends and fastened upon the back of the card. Here and there the lines are tacked to the cardboard by black

thread. As the patient finds difficulty in selecting only a few lines, which are almost equally black, the author, to reduce the number of lines to a minimum, constructs the chart so as to rotate. Lines above and below are marked on the rotating chart, and on the background at 7 1/2 degree intervals. If five lines, for example, are picked out, a rotation of the entire board 7 1/2 degrees to the right, or 7 1/2 degrees to the left, as the case may be, will enable the patient to reduce the number of black lines, in many instances, to two and three, and the exact axis of the astigmatism is more readily selected.

In a second chart Dr. Peter combines the "V-Chart" of Dr. Maddox, which consists of two lines of the same black velvet ribbon fastened to cardboard at right angles. To the end of one of these lines is attached a V, constructed of cardboard and ribbon, and placed upon a cardboard 3 1/2 inches in diameter. If the patient, for example, has selected on the first chart the lines 75, 90, 105, and 120 as the black lines, the second chart is put in place, with the V approximately within this area, from 75° to 120°. The patient very readily recognizes a difference in the shade of the two sides of the V, if the V has not been placed in the proper axis. The darker side is in the direction of the correct axis. The V is, therefore, rotated from one side to the other until both sides are equally black, when the axis is read off.

These charts were not presented to take the place of the usual examination with a cycloplegic which must necessarily be employed in practice. They were presented only as an aid to reduce the time of work and the many vexations which arise in difficult refractions.

Results of Cataract Operations Performed by Colonel Smith at Wills Hospital.

Dr. William Zentmayer read a paper published, (See v. 5, p. 97.), the table of results having been prepared by Dr. C. S. O'Brien, House Surgeon.

The discussion which followed the reading of Dr. Zentmayer's paper was participated in by Drs. de Schweinitz, Radcliffe, Schwenk, and Chance. The conclusion reached by each of these surgeons was that the operation for extraction of cataract by the Smith-Indian method, based upon the results in the group of cases operated upon by Col. Smith at Wills Hospital, was not to be recommended. It was recognized, however, that the trained assistants who constitute a most important adjunct of the Amritsar clinic, would have been a valuable aid in securing better operative results.

Color Vision.

Dr. Burton Chance read a paper on this subject published in full on p. 274.

Charles R. Heed, M.D., Clerk.

ROYAL SOCIETY OF MEDICINE, LONDON.

(Section on Ophthalmology.)

January 13th, 1922.

Dr. James Taylor, President.

The President felicitated Sir John Herbert Parsons on the honor of Knighthood, which the King had recently conferred on him, and in the name of the Section expressed the hope that Sir John would live long to enjoy it.

Sir John Parsons, in returning thanks, said the honor was a recognition of his having served on a number of Government Committees, on which, however, he served only as an ophthalmologist, therefore it was an honor to ophthalmology, and he was the fortunate peg on which it was hung.

Congenital Deformity of Conjunctiva.

Mr. Doyne showed a case with a congenital deformity of the conjunctiva, associated with deformities of tongue and thumb in the same patient.

Filamentary Keratitis.

Mr. Rea showed a case of filamentary keratitis, which lasted three years and had been very resistant to treatment. When bullae were removed, the patient came with a fresh crop in three weeks. Tension was normal, and there was no suggestion of glaucoma. The woman had suffered from arthritis for many years.

Hyaloid Vessels.

Mr. Humphrey Neame showed a case with branching remnants of per-

sistent hyaloid vessels. He thought it likely that these processes arose from one common trunk. Vision in the right eye, with correction was 6/36, in the left 6/9. There was also a thickening of the walls of some of the arteries in the right fundus; the strands had no connection with the lens capsule.

Miss Mann exhibited slides and drawings of embryonic eyes showing the earliest formation of a definite hyaloid artery. Until just before five weeks, she said, the globe was filled with mesoderm, in the meshes of which there were blood vessels, but definite branching arteries could not be traced much earlier than five weeks. There were usually five branches of the vessel, and they broke up again into blood spaces, which quite surrounded the lens. A 3-months embryo showed a differentiation of retina, with optic nerve. From the center of it came a definite hyaloid artery with thick walls. That broke up into five branches. She next showed an equatorial section .6 mm. in front of the disc; it showed a division into three main branches. In the next section, .1 mm. in front of the last, there was again a division into five. That went on to the sixth month, after which it began to disappear again.

Mr. M. S. Mayou referred to injected specimens of hyaloid artery in the embryo which he made some years ago. At the 4th month it could be seen that hyaloid did not break up at the back of the lens, as so many textbooks depicted, but far back in the vitreous. The posterior vascular capsule was formed by a cone of vessels up to the back of the lens. In some cases one branch was found persisting and anastomosing with the ciliary body. Sometimes there were masses of fibrous tissues at the back of the lens, which were supposed to be remnants of the hyaloid artery.

Mr. Leslie Paton suggested that Mr. Neame's case might be one of proliferating retinitis.

Mr. Neame replied that Mr. Paton's suggestion was a likely one; but the five branches seemed to come so locally from the back that this seemed to negative that idea.

Necrosis of Maxilla.

Mr. M. S. Mayou exhibited a baby with acute necrosis in the upper jaw. This was his third case of the kind, all under one year old. One had successive portions of the jaw removed until none remained; it was a spreading necrosis. It was an acute process in all the cases, and he believed the mouth could be excluded as a channel of infection in the present case; moreover, the disease occurred before teething, and before sinuses were present in the bone.

Mr. Leslie Patton mentioned a case of his own of the same character, a healthy breast fed child nearly four months old. When he first saw the child there was a large swelling under the left eye, and the eye was proptosed forward and outward to the extent of an inch. He evacuated about an ounce of pus from behind the eye. Bare bone was evident to the probe, but there had not been time for necrosis to take place. The condition seemed to belong to the same category as acute osteomyelitis in infants.

Mr. Stack enquired whether syphilis and tubercle could be excluded.

Mr. Paton replied that those diseases could be excluded in his own case; the only organism found in it was staphylococcus.

Mr. Mayou, in his reply, said both parents in one of the cases proved negative to Wassermann; in another the doctor was so sure there was no suspicion of syphilis that the test was not applied. The cases were, he thought, too acute for tubercle to be the cause; one had a temperature of 103°, and a pulse of 130.

Operating Lamp.

Mr. Lang showed an operating lamp; it could be attached to the ordinary bracket and carry a 1/2-watt lamp, with the necessary resistance. It enabled fluorescein staining, such as in corneal ulcer, to be well seen.

Trephine Operation for Glaucoma.

Mr. Malcolm L. Hepburn read a paper entitled "Experience Gained from 140 Trephine Operations for Glaucoma."

He regarded glaucoma as such a serious condition, especially the chron-

ic type, with its variety of symptoms and signs, that the question of operative interference merited all possible discussion. Recently contributions had appeared favoring iris inclusion and silk inclusion operations, somewhat to the detriment of the iris free operations. The reporting of late infections had deferred some surgeons from confidently recommending trephining, and had led some to give it up. In perforating wounds of the eye, and after cataract extractions, surgeons tried to avoid permanent inclusion of iris in the wound, because of the danger alleged to be associated with such inclusion, and he could not see the justification of it in operations for glaucoma, unless other methods had failed. The danger of leaving an opening in the eye separated from the external air by only a thin layer of conjunctiva was admitted, but it applied to all filtering scars, and the only question was as to which was the least dangerous.

In the 140 trephine operations he had performed in the last nine years, 27 were in private patients; and if the combined hospital experience of his colleagues could be studied, he thought there would be overwhelming evidence in favor of the trephine operation. At Moorfields, at least, late infection was very rare, and he believed its occurrence in a general way had been much exaggerated. He had not been without complications in his cases.

With regard to the technic he followed, the importance of an efficient conjunctival flap was very great in striving to avoid late infection; he made the flap as thick as possible, and he did his best to prevent tearing or button-holing of the conjunctiva, stripping the conjunctiva off the globe in its whole thickness down to the sclera from the beginning, and continued cutting with the scissors, the points of which were kept directed towards the globe. Toothed forceps he used only for the initial fixation; those subsequently employed were very fine toothless ones. On reaching the limbus he used the secondary cataract knife, keeping it directed towards the globe and pressing slightly. He never found that he got too far forward, as he always found himself further back at the end of the operation than he expected to be. Before commencing rotatory movements, he drew the flap upward and backward so that it was parallel to the trephine, so avoiding button-holing. While rotating the trephine, he directed the handle forward so as to cut thru the anterior part of the scleral disc before the posterior to ensure the formation of a hinge posteriorly when the section was complete; then the disc could be removed later without fear of injuring the conjunctival flap. Having once got the trephine to bite, he did not remove it until the section was finished, so that the full force of the aqueous discharge would push the knuckle of iris well out of the wound. The guide to the penetration of the sclera was the coming up of the pupil toward the hole. When the iris presented, it must be dealt with at once; the disc could be left to take care of itself. He grasped the iris with very fine straight forceps, at the same time pulling downward and forward, so as to detach it from its root. Lastly, he cut off the disc, which could be done easily without endangering the conjunctiva. Usually he inserted one or two stitches in the conjunctival flap; perhaps there should be more.

Proceeding to the consideration of complications, Mr. Hepburn said that if a hole was seen in the flap, a new point of application of the trephine must be selected. Three or four times loss of the disc had happened to him; it might be drawn into the anterior chamber, it might be left in the trephine, or it might be washed away when the aqueous was discharged. Sometimes the iris was so dilated at the time of operation, that the force of the aqueous discharge caused a total prolapse to the pupillary border; in this case all the prolapsed part must be cut off and a complete iridectomy performed. On occasion a complete iridectomy occurred from a too free division. If a complete iridectomy was intentionally done, the iris must be pulled well out of the wound. Apart from cases of buphthalmos—in which the accident was not uncommon—he had had vitreous loss only three or four times. Whether it influenced the subsequent draining capacity depended somewhat

on whether the vitreous was solid or liquid. In two of his cases there was good drainage and no affection of vision afterward; in one case the vision had remained at 6/6.

With regard to delay in the reformation of the anterior chamber, this had occurred in about six of his series of cases. He now allowed these patients to be out of bed at the usual time after the operation, when he usually found that the anterior chamber formed immediately. When this formation was delayed unduly, he was anxious lest there might be adhesion of the iris to the trephine hole; for this reason he always used atropin as a routine treatment. In two or three of his cases the lens had come forward, but only in one case was he able to assure himself that there were no opacities previously. He was not aware of detachment of choroid having happened often in his cases, but it might occur without being recognized. He had not encountered serious complications from this cause, tho it might account for failure in the reformation of the anterior chamber.

What cases were to be included in the term "late infection?" As the permanent opening in the eyeball was the weak point in the operation, the entry of organisms thru this channel must be established to justify the use of the phrase; he thought inflammatory reaction must be associated with rupture of the conjunctival flap. Inflammations occurring many years after operation, when there was a thick and firmly attached flap, could not be included as late infections. And he did not see why every type of inflammation occurring in an eye after trephining should be directly ascribed to the operation.

A general review of his cases showed that by far the best results ensued in cases which he secured early, and especially if he had been able to do the operation at a time when the tension of the eye was normal. In acute glaucoma he trephined only if he had been able to reduce the tension before operating. If he could not reduce it, his practice now was to perform iridectomy. He had seen two eyes in the same patient in which one had been trephined in an early stage, but in which operation on the other eye had to be postponed, and the unoperated eye steadily went downhill with the same symptoms; but, after operation these symptoms were cut short and controlled. That his private cases had been more successful than the hospital ones he attributed to the fact that private patients were more observant and anxious about initial symptoms, and early sought advice. His 13 failures in the 140 had been in cases whose tension at the time of operation was raised, where there was a long history of the trouble, and in which the field had been contracted in a general way, almost to the fixation point. As failures he reckoned those cases in which sight was restricted to finger counting, with much contraction of the visual field, and where no improvement followed the operation. Many cases appeared to have worse vision immediately after the operation but it improved later. He seldom had good results in acute or in secondary glaucoma; both these kinds showed too much congestion round the limbus, and this encouraged healing of the trephine hole. Moreover, in acute glaucoma the conjunctiva was often very friable. He had had two cases of cyclitis; both recovered. He had had no case of sympathetic trouble following trephining.

As a result of his experience, he had formed the opinion that the operation of trephining, performed with every consideration for the conjunctival flap, was the ideal one for chronic glaucoma, especially for the type generally met with in young adults.

Mr. R. R. Cruise said all surgeons naturally preferred the type of operation which, in their hands had been successful. He had now ceased to do trephining for glaucoma, tho at one stage in his practice he trephined all his cases of that nature. He abandoned the operation because of one or two disasters, and since he had changed his operation those had not happened. In two there was an escape of vitreous; he did not know why; not, he thought, thru any fault in technic. At the operation on one of them a colleague was present and praised the operation, foretelling a good result. He called in colleagues in consultation.

The eye remained quiet, but vitreous continued to come out. He cautiously sealed up the hole, and the tension rose to plus 3 or 4, and the lens was drawn up. It was the patient's only eye, and he went blind. In two cases there was infection afterward, causing conjunctivitis; these patients were left with vitreous opacities. He had also had, when doing trephining, a good deal of subconjunctival thickening around the trephine hole margins. For ten years he had been doing a modified flap sclerotomy, doing rather more than Herbert did, i. e., completing the two sides of the flap well forward into the cornea, and beyond the rim of resistance felt when cutting thru. It was very important not to suture the conjunctiva. One of the features of trephining which made him more dubious about it was the transparent pedicle which remained, enabling one to look into the depths of the eye.

Mr. M. S. Mayou agreed as to the transparent bubble which was left after trephining, and it was a spot very difficult to cover and protect. A further objection was, that the cornea had to be split in order to get the trephine on properly. During the last three months the speaker had been carrying out the new operation of Holt, who claimed it did not leave a transparent bubble, and that was true in the cases in which Mr. Mayou had so far done it. He described Professor Harden's method of ascertaining detachment of the choroid. The examination, done as early as the second or third day, was carried out by means of the contact illuminator. This was put on the globe 5 or 6 mm. behind the sclera, and if there was a detachment of choroid, the whole area of sclera right to the cornea would be illuminated; but if the choroid was in its place, there would be illuminated only an area around the point of contact.

Mr. Lang thought the danger arising from the hole in the flap had been much exaggerated. The amount of drainage was directly proportional to the diameter of the trephine hole. The operation he did for glaucoma was a modified Lagrange, turning back a piece of conjunctival flap and taking away a part of the cornea.

Mr. Hepburn, in the course of his reply, considered that Mr. Cruise had had bad luck in his cases, which caused him to adopt a different procedure. He, the speaker, did not find transparent blebs were common, and when they did occur they got thicker with the passage of time. He had never found that splitting of the cornea made any difference. The Lagrange operation was, in his opinion, merely a glorified trephine operation. Tho patients who had a hole in the conjunctiva might survive trouble or escape it, it was not wise to design a procedure on that assumption.

Epibulbar Sarcoma; Penetration of Globe.

Mr. Humphrey Neame read a paper on this subject, illustrated by a number of microphotographs, projected by the epidiascope. In May, 1919, the patient noticed a swelling under the upper lid of the left eye. There was a history of syphilis, of recent ulceration of the palate and deformity of the nasal bones, and the Wassermann reaction was positive. For some time the swelling was regarded as a gummatous infiltration, but as it did not react to antisyphilitic treatment, and the eye was practically blind, Sir John Herbert Parsons, under whose care the patient was, decided to enucleate the eye. Pathologic examination revealed an extensive epibulbar growth, with extension within the globe. The growth surrounded the cornea and, as a thin sheet, spread around the eye to the posterior pole. The iris, ciliary body and choroid were completely infiltrated with the same type of growth. It was a round celled sarcoma, with slightly alveolar formation. Within three months of the enucleation, there was a recurrence within the orbit, and Sir John Parsons carried out exenteration of the orbit. There was a mass of round celled recurrent growth not definitely delimited from the orbital tissues. The stump of the optic nerve, in transverse section at the posterior limit, was free from growth cells. An extension of extrabulbar sarcoma within the globe was an extremely rare condition. Less rarely, sarcoma started in the choroid, and extended out thru the coats of the eye, usually by the perivascular lymphatics of the various perforating vessels. Mr.

Neame thought there was more evidence that this growth was of extrabulbar origin than that it was at first intrabulbar. The reasons he adduced were:

(1) The earliest symptoms were referred to the epibulbar region above the cornea. (2) The vision in the eye, within two months of the commencement of symptoms, was 6/6 with the appropriate glass; no visual failure in it was noted until 7 months after the onset. An extensive choroidal growth usually effected the vision. (3) The growth was much more massive at the point first noticed than elsewhere. (4) The gross appearance of the choroidal growth resembled a secondary or metastatic growth more than a primary growth there. (5) The alternative, flat sarcoma of choroid, was usually densely pigmented, whereas this was a non-pigmented growth. (6) Flat sarcoma was almost always relatively avascular, whereas thruout the present growth there were many delicate capillaries. (7) Flat sarcoma often invaded the deeper layers of the sclerotic, but this growth had only slightly done so, but had definitely invaded the superficial layers of this structure in various parts. He concluded with some extracts from literature bearing on the subject.

Sir John Parsons referred to the close mimicry of this condition, in its earlier stages, of gummatous infiltration of the conjunctiva and sclera, especially when, as in this case, the reaction to Wassermann was positive. Only slowly, after a long course of antisyphilitic treatment had been given, was it realized to be a new growth. Concerning epibulbar growths in general, on reading cases of the kind he could not quite convince himself that there had not been some small lesion in the eye, which had subsequently extended outward. Even in Mr. Neame's case there was that possibility, tho the author of the paper had adduced much evidence favoring the opposite possibility.

Mr. Mayou threw out the suggestion that a flat sarcoma might have existed in the anterior part of the globe and then perforated, good vision nevertheless persisting. In flat sarcoma the retina remained attached for a long time. One of his patients had detachment in the anterior part of the globe, and vision was still 6/13 when the eye was removed. The growth had infiltrated the canals along the vortex of veins and lymphatics. The patient died two years later of recurrence. He suggested that this case should be submitted to a Pathologic Committee, to place it on a sure basis. This was agreed to.

Mr. E. Treacher Collins pointed out that there could be no doubt as to the direction of spread in the case of epithelioma, as that type of growth never started in the eye; however, much doubt might be thrown on the manner of spread of epibulbar sarcoma. He referred to a paper he read some years ago before the Ophthalmological Society on epibulbar epithelioma. He showed then illustrations of epithelioma spreading along the vessels at the limbus into the canal of Schlemm, and he had read of other cases which behaved similarly. A further point favoring Mr. Neame's view was the way the growth spread on the outer surface of the sclerotic. If a piece for diagnosis had been removed in this case earlier, removal of the eyeball might have been obviated, and the case rendered more hopeful. He referred to a case of his own in which he cut off the top of the growth and sent the patient to be further treated at the Radium Institute, and after two or three applications of that salt, the growth entirely disappeared and he knew of no recurrence of it.

Mr. J. H. Fisher agreed that a piece should have been removed earlier, and referred to a case of his own of similar nature in which subsequent application of the actual cautery prevented any recurrence.

Mr. Leslie Paton also alluded to an interesting case, in which the application of radium for 24 hours after the operation kept the man free for a long time, and a swelling of the soft palate, probably of the same nature, which developed was similarly treated with radium and also disappeared.

H. Dickinson.

SPECIAL REPORT

INDUSTRIAL INSURANCE AND INDEMNITY RULES FOR THE EYE, OF THE GOVERNMENTS OF THE UNITED STATES, GREAT BRITAIN, FRANCE, ITALY, BELGIUM, AND GERMANY.

HARRY VANDERBILT WÜRDEMANN, M.D., F. A. C. S.,

This is from a report made to the Pacific Coast Oto-Ophthalmological Society. The portions referring to the eye are here included. The full report, also referring to the ear, nose, throat and face, is published in the Transactions of the Society.

GENERAL GOVERNMENT SERIES, UNITED STATES OF AMERICA.

To guide the Medical Officer in rating eye cases (particularly for refractive errors) the opinion must conform to the opinion of the General Counsel issued regarding eye cases causing less than ten per cent disability, viz.,

(a) No treatment or corrective appliances (glasses) can be provided unless the disability is ten per cent and is shown to be connected with service.

(b) If the disability is due to those defects of form, shape, and structure of the eye which are known to be of congenital origin, such as astigmatism (except traumatic) and hypermetropia and myopia, even if not noted as existing prior to service, it will not be considered as of service origin and will not justify treatment or compensation, even if thought to cause disability of ten per cent or more.

(c) The supplying of glasses for correction of refractive errors during service, unless there is specific evidence showing that the character of duties performed during service were such as to have certainly caused or aggravated such errors of refraction, shall not be construed as evidence of service origin of refractive errors known to be due to congenital errors of structure, form, or shape of the eye.

(d) Provision of glasses shall not be authorized in any case by temporary partial rating of ten per cent, or more, for a limited period, or by other use of rating unless the conditions under (a) are shown to prevail.

(e) When a rating of ten per cent or more is given a disease or disability, other than a defect of refraction, in the treatment, relief, or care of which the correction of the refractive error is considered to contribute an important or essential element, the rating will be concurred in even if the refractive error is rated at less than ten per cent, and the claimant will be ruled eligible to receive such correction of refraction as will materially contribute to the cure, arrest, or maximum improvement of the condition for which the rating of ten per cent or more is made.

For the correct application of the War Risk Insurance Act, in cases in which the claim for treatment or compensation is based on the presence of refractive errors, the following is for information as a guide in the making of ratings.

There will doubtless appear for some time, but in a continually diminishing number, patients for whom authority has been given on a temporary partial rating of ten per cent for a limited period, for the purpose of permitting them to obtain glasses. This, we are advised by the General Counsel, is not permissible under the Act and will be discontinued.

Without authority based on service connection and ten per cent or more disability for refractive error, you may not authorize the supply of glasses, except under such conditions of emergency as may arise in each case. Loss of glasses, need of change of glasses, several months after discharge, etc., are not considered an emergency within the meaning of the law. When patients are hospitalized, or are being treated for compensable defects as out patients at the various hospitals or dispensaries, the treatment of refractive errors may be supplied, if it is considered by the attending physician or surgeon in

charge, to be a proper part or adjunct to the treatment of the conditions for which the claimant is under treatment as a compensable defect due to service.

It must be left to the discretion of those immediately in charge of the sick patient to determine whether correction of a congenital refractive error is necessary or properly contributory to the treatment of the condition for which authority has been given for hospital or other care.

In the future, this Bureau will not authorize provision of glasses except as specified in the above memorandum. This applies to our procedure from this date forward and does not affect authorization already issued, which must be honored.

Abbreviations used—
T.P.—Temporary partial
P.P.—Permanent partial
P.T.—Permanent total.

(1) The ratings for refractive errors, as herein stated, are in all cases where visual acuity has been corrected with proper lenses. If due entirely to refractive errors, no rating should be awarded for any defect in visual acuity. Progressive high myopia with degenerative changes in the eye should be considered a disease, and so rated.

(2) For the purpose of rating visual disabilities due to corrected refractive error, 20/40 vision (Snellen) in each eye shall be considered the minimum of normal visions, and vision of less than 10/200 in an eye will be considered as equivalent to total loss of vision in that eye. If due to an injury or disease originating during service, no rating should be awarded for any defect in visual acuity which is 10/20 or better in each eye, or can be corrected by glasses up to 10/20 or better in each eye.

(3) In determining whether the defect in the visual acuity is due in any way to an injury or disease originating during the service, the history of the case and the result of a competent ophthalmologic examination should be carefully considered, and the Specialist's report confirmed by a Consultant Eye Specialist.

(4) If recorded on enlistment, or having history of injury preexisting to enlistment, the following conditions may be considered as "Obviously apparent" on enlistment—External injuries or scars; organic disease in the interior of the eye, such as choroiditis, optic atrophy or possible lens changes.

(5) Functional loss of vision should be rated as less than ten per cent whether in one or both eyes.

In functional visual defects it is necessary to take into account—

(a) Visual acuity
(b) Field of vision
(c) Binocular vision.

Errors of color and light sense, notwithstanding their rarity, are symptoms of lesions of the nervous system and should be taken into account in conference with the Neuropsychiatric Section in the estimation of the disability due to these lesions.

Color blindness of congenital origin is not to be considered of service origin.

To the above table of ratings, a certain percentage shall be added for special conditions enumerated as follows:

(a) Obliteration of direct vision (such as from corneal opacity, deformed pupils, central choroiditis, lenticular opacity and retinal detachment).

For one Eye Add 10% P.P.
For both Eyes Add 20% P.P.

(b) Extraction of lens:

For one Eye Add 15% P.P.
For both Eyes Add 30% P.P.

In rating for extraction of lens either unilateral or bilateral the combined vis-

SCHEDULE OF PERMANENT RATINGS FOR PROPERLY CORRECTED REFRACTIVE ERRORS IN VISION. ONE EYE.

Other Eye—	Of or less than 10/200	10/200	20/200	20/100	20/70	20/50	20/40
Of or less than 10/200	100%	90%	80%	70%	60%	40%	30%
10/200	90%	80%	70%	50%	45%	30%	25%
20/200	80%	70%	50%	40%	35%	25%	15%
20/100	70%	50%	40%	30%	25%	20%	10%
20/70	60%	45%	35%	25%	20%	15%	7%
20/50	40%	30%	25%	20%	15%	10%	5%
20/40	30%	25%	15%	10%	7%	5%	0%

ual acuity for correction should be taken into account.

Provided, that that part of the above percentages will not be added which will increase the total percentage to exceed 100%; that no percentage for more than one of the above conditions, will be added to the same case, and that no total percentages will be given for any of the above conditions which is in excess of that given for complete loss of sight in the affected eye.

It is necessary to establish a general rule:

(1) In each case where ocular functional troubles, without anatomic lesions of the eye or its adnexae, as evidenced by objective examination, can only be considered absolutely incurable when the central or peripheral vision is involved.

(2) It is also considered the same in all lesions as cataracts, retinal detachments, and ocular hemorrhages, in the stage of evolution.

BLINDNESS OR IRREMEDIABLE LOSS OF SIGHT.

In this category should be considered the absence or atrophy of the two globes, leucoma, cicatricial staphylomata occupying the greater part of the corneae, complete atrophy of the optic nerve, extensive cicatricial lesions of the chorioretina in the region of the posterior pole, and retinal detachment in the stage of evolution.

From a practical standpoint blindness can be considered to exist where the central visions of one eye equals 1/20 with a deficient visual field, the other being inferior to 1/20.....100%

In other words 10/200 in one eye, and less than 10/200 with deficient visual fields.....100%

It is necessary to distinguish cases of loss of vision without apparent lesions, from loss of vision accompanied by mutilation such as enucleation, atrophy of globe, and extensive staphylomas.

Lack of accommodation and convergence (according to Duane's table) .....T.P. 20%
Diplopia (uncorrectable) ...P.P. 30%
Loss of conjugate movement in both eyes or three movements in the seeing eye .....P.P. 50%
Permanent concentric contraction in field of vision in one eye to 10%, not subject to restoration by treatment .....P.P. 10%
Permanent concentric contraction in both fields to sixty per cent or loss of temporal halves. P.P. 75%
Loss of nasal halves in both fields .....P.P. 50%
Homonymous hemianopsia, lateral, superior or inferior..P.P. 40%
Concentric contraction of both fields to thirty per cent...P.P. 25%
Concentric contraction of both fields to ten per cent of normal with retention of normal central vision .....P.P. 50%
Scotomas rated on interference with visual acuity.
Color blindness .....P.P. 10%
Heterophoria to a degree sufficient to produce asthenopia .....P.P. 10%
Nyctalopia (in proportion to degree of light sense).....P.P. 20%
Retinitis Pigmentosa. Rate on contraction of visual field and visual acuity.

(1) *Eye Lids*:
Infectious processes and tumors .....See face.
Lagophthalmus .....P.P. 20%.
Ectropion — Uncomplicated —Remediable .....Less than 10%.
Entropion—Irremediable ..Less than 10% to 30% P.P.
Symblepharon—Complicated —Epiphora—Remediable..Rate on complications. T. P. 10%. T.T. if hospitalized.
—Irremediable .....P. P. 10% for one eye. P. P. 15% for both eyes.
Ptosis—
One eye .....P. P. 15%.
Two eyes .....P. P. 25%.

(2) *Eyeball*:
(a) Injuries, Infections and Inflammations (including Glaucoma, Keratitis, Iritis, Iridocyclitis, Uveitis, Scleritis, Panophthalmitis .....T. P. 10% to T. T. depending on clinical findings.
Sequelae—(Rate on visual and cosmetic defects) .....
(b) Tumors—
benign .....Rate on visual and cosmetic defects.
malignant .....P. P. 10% to P. T.
nystagmus .....Rate on visual defects.
(c) Enucleation of eye ball. P. P. 40%.

Traumatic Cataracts:

(a) Nonoperable. The rating to depend upon degree of visual acuity:

(b) Operable, or where the cataract is absorbed.

If the vision is below that of the nonaffected eye by reason of the impossibility of fusion of images, add 10% if the total disability will not be more than the loss of vision on one eye.

If the vision of the noncataractous eye is worse or absent, refer to the table of visual acuity, rating the aphakic eye according to the best optical correction.

Dislocation of the crystalline lens, intraocular hemorrhages, and detachment of the retina, causing different degrees of disability, will be rated according to the degree of vision.

In all conditions involving the optic nerve, the fields of vision must be recorded.

In conditions with diplopia, muscles involved must be specified.

Paralysis of muscles of only one eye .....P.P. 25%
Paralysis of muscles of one eye and one muscle in working eye .....P.P. 35%
Paralysis of muscles of both eyes, working eye 3 or more muscles .....P.P. 40% to 50%
Paralysis of all muscles of both, or of working eye.....100%

In all cases of total blindness, where the claimant is in constant need of a nurse or attendant, an additional rating of twenty per cent shall be had from the date of permanent and total blindness.

Complete loss of taste and smell .....P.P. 35%
Loss of taste .....P.P. 25%
Loss of smell .....P.P. 15%

Note: In all border line cases a conference should be held with the Section within whose jurisdiction the disability is handled, and a combined rating arrived at to cover the disability.

MUTILATING WOUNDS, SCARS AND SUBSEQUENT DISFIGUREMENT AND PLASTIC OPERATION.

The precise disability resulting from the destruction of the important special organs, interfering with the motor or sensory functions will be accurately observed and rated. The position and extent of scars will be noted as well as any symptoms which they produce.

In all cases where disfigurement is noted, an unretouched photograph, passport size, should be requested. All plastic operations with the after results should be carefully considered, and the case rated accordingly.

Luetic and tubercular infections are not to be rated by the Eye, Ear, Nose and Throat Medical Referees, but shall be referred to the General Medicine and Tuberculosis Sections for a rating.

GREAT BRITAIN.

Cases of industrial disease for which compensation was paid. These figures are compiled from returns from (a) insurance companies which handle this type of business and (b) employers who insure privately.

(A) Cases continued from previous years. (B) Cases in which first compensation was paid during year.

		1910	1918	1919
Nystagmus	A	662	2550	3731
	B	956	1780	2718
Cataract in glass workers.	A	1	..	..
	B	2	..	1
Ulceration of cornea	A	..	2	..
	B	..	20	1

Accidents reported under the Factory and Workshop Acts to Certifying Factory Surgeons:

Loss of sight of one or both eyes.

	1910	1911	1912	1913	1914
Adults (over 18)—					
Males	49	48	48	79	48
Females	7	8	6	4	2
Persons under 18—					
Males	6	6	7	15	7
Females	1	1	..	7	2
Total	63	63	61	105	59
Accidents resulting in other eye injuries—					
Total	2044	2221	2277	2518	2444

FRANCE.

Extract from schedule of ratings for disability established by the decree of May 29, 1919, for application to your law of March 31, 1919, for war injuries.

It is necessary to establish general schedules:

1. In each case of functional ocular affections without anatomic lesions of the eye and its adnexae appreciable by objective examination, which is not to be considered absolutely incurable, which affect the central or peripheral vision.

2. It is the same with such lesions as cataract, detachment of the retina, ocular hemorrhage, etc., which may proceed.

3. In functional visual affections it is necessary to extend:

(a) the central vision (visual acuity);

(b) the peripheral vision (visual field);

(c) the binocular vision.

The affections of the chromatic and lid senses, which are very rare, are symptoms of lesions of the sensory nerve apparatus. They are to be considered with the other lesions.

I. Blindness or irremedial loss of vision.

In this category and cause: absence or atrophy of both globes, the leucomas and cicatricial staphylomas occupying the greater part of the cornea, complete atrophy of the optic nerve, profound cicatricial lesions of the choroid and retina in the posterior pole, detachment of the retina in the latter stages.

Practically, there is considered as partial blindness all those defects which affect the sense of vision or the visual field a twentieth part.

Total loss of vision in one eye, the other not being affected.

Loss of vision of one eye without apparent deformity 25%
Ablation or atrophy of the globe with deformity met by permanent prothesis 30%
With cicatricial lesions not permitting the use of an artificial eye 40%

Central vision. Reduction or loss of the visual acuity in the two eyes. The visual acuity is not estimated which takes count of optic correction by spheres, cylinders or spherocylinders. All the procedures usually employed to determine simulation or exaggeration are to be used in the functional examination.

In most of the former schedules the absolute disability for the blind was considered 125% and the tables were made in proportion.

Concentric contraction of the visual field.

To 30°, one eye .....0 p. 100
Two eyes .....20% —
Less than 10%, one eye....10% —
Two eyes .....70 to 80% —
Large central scotoma, one eye .....15 to 25% —
Two eyes .....70 to 100% —

Hemianopsia, implying loss of symmetric vision in two portions of the visual fields of either eye, with conservation of the central vision.

Homonymous, right or left..25 p. 100
Heteronymous nasal exceptions .....10% —
Heteronymous temporal exceptions .....40% —
Superior .....10% —
Inferior .....50% —
Hemianopsia in quadrant....10% —

Cases of hemianopsia which affect both horizontal and vertical or three quadrants of the visual field are obscure. Hemianopsia with loss of central vision of one side or both, refer to the table above, the total amount not to be more than 100%.

BINOCULAR VISION.

The function of equilibration which permits the two eyes to fix on the same object is equal on both sides. The diplopia is produced by paralysis of the excentric ocular muscles involving one or several.

Diplopia making it necessary to cover one eye 25%

Other Ocular Affections.

Ophthalmoplegia, internal unilateral ..... 5 to 10%
Bilateral .....10 to 20%

TRAUMATIC CATARACTS.

(a) Nonoperable (Amount depending upon the extent of visual acuity); (b) Eye operated or having the cataract resorbed.

If the vision is inferior to the eye which is not wounded, on account of

Visual acuity—	To 5/10	4/10 or 3/10	2/10	1/10	1/15 to 1/20	Less than 1/20 to 0	Apparent deformities with or without prothesis
1 to 5/10	0	5	10	15	20	25	30 to 40
4/10 to 3/10	5	10 to 15	15 to 20	25 to 30	30 to 35	40 to 45	45 to 50
2/10	10	15 to 20	45	50	55 to 60	60 to 70	75 to 80
1/10	15	25 to 30	50	65	70 to 80	85	90 to 95
1/15 to 1/20	20	30 to 35	55 to 60	70 to 80	85 to 90	90 to 95	100
Deformities with or without prothesis ..		45 to 50	75 to 80	90 to 95	100	100	100

NOTE:—The percentages are established from 10 to 100%. 100% is considered total disability.

the impossibility of making fusion of the images, allow 10% in the extent of 25% when the vision of the eye is lost.

Example:

V. O. D. (healthy)—1
V. O. G. (operated)—1 to 5/10 +10 D..... 10%
V. O. D (healthy)—1
V. O. G. (operated)—1/10 below + 10 D 25%

If the vision of the noncataractous eye is worse or absent, give optical correction of the aphakic eye. The luxation of the crystalline lens, intraocular hemorrhage, detachment of the retina are susceptible of modification, and, therefore, should be estimated upon the degree of vision.

OCULAR ADNEXAE.

(a) Bony orbit.

Destruction of one part of the orbit and its contents comprising the eye, severe lesions of the preorbital sinus and the nasal fossa, mutilation requiring restoration or prothesis .....50 to 70%
Paralysis of one or several muscles (diplopia) 25%
Vascular alterations (aneurisms, pulsating tumor of the orbit) following functional trouble .....20 to 60%

(b) Lids.

Most of the lid affections are curable by operations.

Destruction of the lids (entropion, trichiasis, ectropion, vicious cicatrices, symblepharon and ankyloblepharon) are to be corrected and adjudged according to the diminution of the visual acuity .....0 to 10%

Ptosis, curable by operation, otherwise to be judged on whether or not the pupil can be uncovered, depending upon the percent:

One eye .....10 to 20%
Two eyes .....40 to 70%
Lagophthalmos with facial paralysis:
One eye, depending upon complications..10 to 20%
Two eyes, depending upon complications..30 to 50%

(c) Lacrimal passages.

Epiphora ..... 0 to 10%
Fistula with lesions of the bones:
Unilateral 20%
Bilateral 40%

ITALY.

First National Congress of Eye Injuries.

The conclusions of the commission can be grouped as follows:

1. At first the commission has recognized the necessity of limiting the tables to cases of diminution of the acuteness of vision, i.e., those injuries that represent by themselves only the major part of the damage to the working visual capacity. It is understood that the anatomic, functional, collateral alterations, closely limited to the reduction of the acuteness of vision, are included in the valuation of these reductions.

Those approved are, therefore, basal valuations that could undergo amendments. Functional alterations of importance influence the diminution of the acuteness of vision, inducing larger reductions of the faculty of vision. Reduction of the visual field it is not necessary to hold important, as increasing the valuation of the reduction of the acuteness of vision, as these are based on a valuation of 35% for the loss of an eye, which includes also the valuation of the damage determined from the corresponding reduction of the visual field, so that counting their increase in the per cent for such reductions would cause it to be counted twice in determining the amount of damage of the capacity of vision as regards the amount of effective work.

2. To the theme of the damage determined from the reductions from the capacity of vision in one eye, or the damage resulting from the reduction of the capacity of vision already below the average, are contemplated in conditions preexisting that are additional causes of incapacity. In fact the valuations that follow regard simply the cases in which subjects prove a single accident, and are based on the functional alterations hereinafter indicated.

3. The commission has also held that, it being the intention to formulate a table to apply in the present legislative regime in which no account is held as to the occupation of the injured one, in determining his damage, by referring the ocular damage to a single valuation of 35%, for the anatomic or functional loss of an eye; it would not be proper to follow the tendency for a valuation differentiated from the vari-

ous damages in the various types of work, a tendency that the Congress did not accept in the discusston of this subject.

4. The commission has adopted the following subdivisions of injuries, as proposed by Valenti, distinguishing four conditions.

I. Lesions reducing the vision in one eye only.

II. Lesions reducing equally the vision of both eyes.

III. Lesions reducing in unequal proportions the vision of both eyes.

IV. Lesions that abolish the capacity of vision in one eye and reduce in various amounts the vision of the other.

5. The reduction of vision in one eye only.

(a) Vision of 6/10 is considered as the minimum damage to the working capacity as by a loss, i.e., of 5%.

(b) Vision of 1/20 is considered as the minimum that allows a capacity for working vision; vision of one eye inferior to this is considered equal to blindness and is, therefore, valued as an incapacity of 35%.

(c) Intermediate vision, between these amounts, of one alone should be valued progressively in a certain decimal percent of the vision; in the higher vision that which would correspond with the per cent of incapacity; but less high than for the decimal proportions lost in the lower vision. By giving a little working margin the opportunity of using round figures of easier application, and the difference that might result from applications of a progressive valuation, it was decided to adopt the following intermediary percentage:—

Reduction of vision of one eye: to 5/10 equals 10%; to 4/10 equals 15%; to 3/10 equals 20%; to 2/10 equals 25%; to 1/10 equals 30%; to 1/20 equals 33%.

6. In the reduction of both eyes equally:

A vision of 7/10 corresponds to a minimum vision of 5%; a vision of 1/20 corresponds to the minimum of visual capacity utilized for efficient work, i. e., an incapacity of 95%. For intermediary vision, it is possible to use the following scale in a progressive manner. Vision in both eyes, 6/10 equals 10%; 5/10 equals 20%; 4/10 equals 30%; 3/10 equals 45%; 2/10 equals 60%; 1/10 equals 75%.

7. In cases of unequal reduction of binocular vision, we consider the vision most useful for the subject is that of the eye less injured, and that, therefore, a base for the valuation must be that of the retention of the binocular reduction equal to the vision of the eye less damaged. It is evident that one must make a valuation of the damage higher than that taken as a base, and it is also clear that one cannot make a valuation that approaches that of cases of binocular vision corresponding to the eye most damaged. For simplicity in calculation, that would feature the uniformity of a valuation criterion, it was decided that it should be made the midpoint between the valuation corresponding to the equal binocular reduction of both eyes. So that in case of vision in O.D. 5/10; in O.S. 1/10, one would take the midpoint of the valuations of the monocular vision equal to 5/10 and 1/10, i.e., of 20% and 75%. The indemnity damage resulting would be 47, rated 5%.

This method apparently will give adequate valuation in cases with a notable difference between the vision in two eyes, and absence of binocular vision.

Note the valuation eventually that of the loss in one eye and reduction of the other to a vision at the highest point of the two eyes, so it can only be verified with a certain arithmetic calculation when the vision in one of the two eyes is of 1/20, and the other superior to 3/10; in such cases one applies the valuation on the hypothesis of the loss of one eye and reduction of the other to the measure less damaged.

8. In cases of blindness of one eye and reduction of vision in the other.

(a) The monocular vision 8/10 would correspond to damage immediately superior to the loss of an eye, i.e., 40%.

(b) Monocular vision of 1/10 corresponding to the minimum of utilizable capacity for vision for efficient work, i.e., damage of 95%.

(c) For monocular vision intermedi-

ary the following scale should be adopted. Vision of 7/10 equals 45%; 6/10 equals 50%; 5/10 equals 55%; 4/10 equals 60%; 3/10 equals 70%; 2/10 equals 80%.

The conclusions of the commission, after brief discussion, were approved unanimously.

They may be readily assembled in the following tables:

A. TABLE APPROVED BY THE CONGRESS.

Vision	Monocular Reduction Percentage	Equal Binocular Reduction Percentage	Blindness of one eye and reduction of other Percentage	Unequal binocular reduction
1	2	3	4	5
9/10	0	0	35	Arithmetic medium between the two valuations indicated in column three, for vision of either of the two eyes, in such a way as to extend in cases in which one of the two eyes has a vision of 1/20, the percent indicated in column four for the vision of the other eye.
8/10	0	0	40	
7/10	0	0	45	
6/10	5	10	50	
5/10	10	20	55	
4/10	15	30	60	
3/10	20	45	70	
2/10	25	60	80	
1/10	30	75	95	
1/20	33	95	100	
1/20	35	100	100	

B. SYNOPSIS OF THE VALUATION OF THE REDUCTION OF THE ACUTENESS OF VISION.

Vision O. D. / Vision O. S.	9/10	8/10	7/10	6/10	5/10	4/10	3/10	2/10	1/10	1/20	1/25-0
9/10	0	0	0	5	10	15	20	25	30	33	35
8/10	0	0	0	6	10	15	22.5	30	37.5	40	40
7/10	0	0	5	7.5	12.5	17.5	25	32.5	40	45	45
6/10	5	5	7.5	10	15	20	27.5	35	42.5	50	50
5/10	10	10	12.5	15	20	25	32.5	40	47.5	55	55
4/10	15	15	17.5	20	25	30	37.5	45	52.5	60	60
3/10	20	22.5	25	27.5	32.5	37.5	45	52.5	60	70	70
2/10	25	30	32.5	35	40	45	52.5	60	67.5	77.5	80
1/12	30	37.5	40	42.5	52.5	60	67.5	75	75	85	95
1/20	33	40	45	50	55	60	70	77.5	85	95	100
1/25-0	35	40	45	50	55	60	70	80	95	100	100

BELGIUM.

There is no official scale for disabilities from accidents occurring in vocations.

The percentage is determined by the judge; from the medical reports, in which the kind of work and the age of the injured person are considered. Leon in his commentary upon the law of 1903 established an approximate scale which varies in each case, depending upon the opinion of the judges.

GERMANY.

The Industrial Insurance Department at Berlin was merged into the Imperial Insurance Department on February 12, 1921.

The percentage of the various kinds of accidents in trades vary according to the kind of trade, and for these there are no authentic data. There are, however, a number of communications in the literature. What we have of the official registrar will be found in the report of the insurance office from 1886 to 1912, particularly on page 443 and following. Especially will be found some statistics for the year 1907, (published in Berlin, 1910, by Verlag von Behrend and Co.) relating to injuries of the eye from burns and caustics and scalding.

There are 30 and 100 of wounds and crushes, etc. 5.02 and 100 of other injuries occurring to the eyes. Of these 61.45 per cent have retained foreign bodies. Seven cases, i.e., 0.16 per cent of all eye injuries become total blindness. 303 cases, i.e., 6.78 per cent in the right and 314 i.e., 7.08 per cent in the left.

American Journal of Ophthalmology

Series 3, Vol. 5, No. 4 April, 1922

PUBLISHED MONTHLY BY THE OPHTHALMIC PUBLISHING COMPANY

Original papers, correspondence, and other scientific communications should be addressed to the Editor. Books for review may be sent to any member of the editorial staff. Reports of society proceedings should be sent to Dr. Harry S. Gradle, 22 E. Washington St., Chicago, Ill. News items should be sent to Dr. Melville Black, Metropolitan Bldg., Denver, Colo.

Proof should be corrected, and returned within forty-eight hours to the printers. Reprints may be obtained from the printers, Tucker-Kenworthy Co., 501 S. La Salle St., Chicago, Ill., if ordered at the time proofs are returned. But reprints to contain colored plates must be ordered when the article is accepted.

Copy of advertisements must be sent to the Manager by the fifteenth of the month preceding its appearance.

Subscriptions, applications for single copies, communications with reference to advertising or other business, should be addressed to the Manager of Subscriptions and Advertising

JEAN MATTESON, Room 1209, 7 West Madison Street, Chicago, Ill.

ORTHOPTIC TRAINING.

The mass of muscle in the blacksmith's arm or about the shoulders of the boxer, are very obvious results of exercise—they have bulk and weight. But even for the blacksmith or the boxer, accuracy and quickness, skill and success, depend on the development of nerve cells and coordinations. These cannot be seen or weighed, but they are essential to the results sought. With the ocular muscles, changes of size and weight are not perceptible; and the increased power secured by orthoptic training lies to an even greater extent in the improved organization of related nerves and centers. The skilled musician does not have any remarkable muscular development, but an accurate perception of pitch and time, and a wonderful development of the power to coordinate with his sensory centers, the motor centers that control the manipulation of his instrument.

To speak of exercises for improving the coordination of ocular movements as "muscle training" is to ignore the essential object of the exercises, and encourages a habit of false or indefinite thinking about the real nature of defects of ocular movement. The person with perfect ocular movements generally cannot turn his eyes farther in any plane than the one with heterophoria, or actual squint. He can only turn them as he desires, more accurately, or more easily, with less of conflict and strain in the use of certain parts of his central nervous system.

Orthoptic exercises are for "nerve training." In general they require the nerve centers to initiate, and the nerve trunks and muscles to carry out, unaccustomed coordinations. They bring new distributions of nerve force from the motor centers, under guidance of the visual perceptions. Exactly how this is done we know little more than did the newsboy, who tried with poor success, to teach another how to fold his papers, and who concluded, "You just have to do it till you get the trick." The orthoptic exercises keep the pa-

tient trying till he "gets the trick," and later he finds that he has learned an easier or more accurate way of making his eye movements.

The mechanism of our ocular movements does not enter our consciousness. We are conscious of results attained, and a sense of effort to attain them. The changes that intervene and bring about the results are subconscious. But the effort must be made, and the movements guided by their effect on vision. The power to fuse and to see double, are essential to training in binocular movements and binocular vision. All forms of orthoptic apparatus depend for their usefulness on the presence of a fusion sense. But whether this sense is strong or feeble, real "exercise" is possible only by the patient making an effort.

In general, the younger the patient, the greater the capacity to learn correct ocular movements. This does not mean that the child has any less need than the adult to make an effort, to *try* to do the thing. His superior aptitude lies largely in his general readiness to try anything. The help given by apparatus, or the person who supervises such exercises, lies largely in the power to stimulate the child to make the effort of fusing the images, or keeping them fused. The training should be given as early as possible. But it is only possible, when the child's interest and cooperation can be secured; and it is profitable in exactly the degree that they are awakened.

For this reason attempts at orthoptic training are often unsatisfactory in young children. Sometimes an intelligent and highly interested mother can learn to supervise such training, so as to get important results at 2 or 3 years of age. But many children can be induced to make the necessary effort only by the exercise of great tact and patience. It is the possession of these qualities that makes some ophthalmologists successful with orthoptic exercises in a large proportion of cases, while others fail.

In a few patients one or two lessons in the coordination of their movements will lead to the establishment of correct habits of movement, especially if the faulty movements have arisen recently. In the greater number long persistence in the training is needful. Sometimes improvement will be noticed very quickly, in other cases no progress may be noticed for a long time, and then it may be rapid. In general it is hardly worth while to begin orthoptic training unless it can be kept up; at least its possibilities will not be developed in the individual case without prolonged, intelligent, tactful trial. Javal may have exceeded the truth in saying that probably all cases of early squint might be cured by orthoptic training; but certainly most ophthalmic surgeons will agree that in many cases such a cure would not be worth the trouble.

In later life we encounter patients who furnish ideal cooperation, who have a strong desire to overcome their defects of ocular movement; and have trained perseverance to keep up the effort needed to secure slow gains. These patients are at a disadvantage because of their loss of the plasticity of childhood; but only persistent trial can show how much they may gain. It may be true that the development of binocular fusion can only begin in early childhood. But even in a case of high squint, that has lasted for many years, we cannot be sure that the fusion power had not already developed to some extent before the squint began; and prolonged trial to elicit fusion may yield a positive response. In view of the limitation of our knowledge of this subject in general, we are justified in trying orthoptic training in every case of either heterophoria or heterotropia. Only in this way can we increase our knowledge of the general subject, or give the best service to the individual patient. E. J.

THE EVOLUTION OF BINOCULAR VISION.

It is generally recognized that among mammals, man and the animals most nearly related to him alone possess what we know as binocular vision.

How it arose is traced by Treacher Collins, in his Bowman lecture of 1921, to the arboreal life of our ancestors and their assumption of the erect posture. It seems intimately correlated with changes in the form of the crystalline lens and ciliary body, the extension of the powers of accommodation, more accurate vision at the macula and improved light adaptation and color perception.

The herbivorous animals "grasp their food directly with their mouths, finding that which is suitable more by smell and by the touch of their exquisitively sensitive snouts." They need a wide range of panoramic vision to quickly perceive their enemies, but do not require accurate vision at a fixation point or exact judgment of distances. The carnivorous animals have more need of accurate vision and judgment of distance to seize their prey. But when monkeys began to live in trees, to find nuts and fruit mostly by sight by accurate discrimination of form and color, seize food, parasites and weapons in their developing hands, the need for accurate vision at the point fixed and judgment of its relative distance, became essential.

The rabbit, the deer and the horse have widely separated eyes with very large corneas capable of perceiving objects in a very wide field, but not able to see very accurately in any part of it, and with little of the fields of the two eyes in common. In the cat the eyes have moved more to the front, so that both can see the prey to be seized and give an accurate judgment of its distance. But the cat's cornea is still large, so that the young kitten has a cornea closely resembling that of an adult human eye.

The cat can use the two eyes together, but not like men and monkeys. It has little accommodation to make exact near vision possible. Barrett found that the cat, with eyes thoroly under atropin, caught a mouse about as well as when its eyes were normal. Only among some monkeys has a power of accommodation anything like that in the human eye been discovered. Exact macular vision is useful only as the eye can be directed so that the image of the object of interest will make its impression exactly on the sensitive region. The more exact such vision the more exact must be the ocular movement that responds to it. The greater the dominance of macular vision the more important it is to have both maculas receiving the same image. Accommodation and convergence being closely associated in use, were closely associated in evolution.

The practical value of such studies lies in the better understanding they give of the nature and relations of defects of ocular movements. Binocular vision, recently evolved, is particularly liable to exhibit atavistic defects; and having been recently developed in the race, it is more dependent on development in the individual than are most other ocular functions. Here lies the explanation of why defects of binocular movement, squint and heterophoria, are so much more common than other congenital defects of movement. Here, too, is a reason for the large possibilities and importance of orthoptic training. E. J.

THE PHYSICIAN AND THE OPTOMETRIST.

Should there be any relation of the general profession to the optician? Yes and no. *Yes* in the one sense, for the mechanical work of finishing lenses and fitting frames, but absolutely no further. *No* as regards any relation of the physician to the prescribing optician. This word is final, and it is time that the medical profession be again warned against the attempts of the prescribing optician to secure consultations on equal terms with the doctor.

This warning is brought out by an article in the *Medical Sentinel* of Portland, Oregon, of February 1922, in which the editor takes the stand that "The measurement of the refractionist and muscular state of the eye is a limited specialty—it is the work of the optometrist or refractionist and not of the pathologist. Refractive errors are physiologic not pathologic. The optometrist is therefore in a position to cooperate

with the physician in a very efficient and satisfactory way."

These statements are manifestly false. In the first place, there are but few men uneducated in the general diagnostic science of medicine, who are able to even get the exact rule of thumb measurements of refraction as accurately as can the ophthalmologist. In the second place it is not always that the full measurement of the ametropia should be prescribed. It must be varied to suit not only the eye itself; but the condition of health, and of work that the person is doing who needs glasses if only in order to see better.

Many persons who feel the need of glasses, have some eye disease or general affection which could be discovered by a professional examination, and which in most cases is amenable to treatment, with the result of saving sight, bettering the health and preserving life.

Certainly the clerks in the stores, who call themselves opticians, have not sufficient knowledge to take care of such important conditions. Altho a large proportion of people first try the optician without going to an oculist, and we believe that the optician may be allowed to prescribe glasses to those people who directly apply, in simple cases, where to the layman there is no evidence of disease; the better class of opticians refer any cases in which there is evidence of disease to an ophthalmologist for further examination, and so far as the prescribing of glasses goes, the patient often finds out that it costs him less.

The very idea of physicians referring what is really medical work to nonmedical men is repugnant, impractical, and to the disadvantage of the patient. Let us hope that none of them will follow such maladvice as the editor of the *Medical Sentinel* gives.

This editorial is likewise an advertisement of a special optician, being a rank piece of editorial malpractice; and something indeed which the daily papers, or even those of the yellow variety, would not countenance; for their advertisements are confined to their advertising pages and not mixed up with such offensive "blurbs,"

H. V. W.

BOOK NOTICES.

Anatomy of the Human Orbit and Accessory Organs of Vision. S. Ernest Whitnall, M.A., M.D., B. Ch. (Oxon.), M.R.C.S., L.R.C.P. (Lond.) Prof. of Anatomy, McGill University, Montreal. Published by Henry Frowde and Hodder and Stoughton, London. Oxford University Press, American Branch.

This work comprises 427 pages, with 195 illustrations. The press work is excellent, and the illustrations, which are chiefly photographs of actual dissections, are quite good, many having exceptional merit. The text is divided into four parts: I. Osteology. II. Eyelids. III. Contents of the Orbit. IV. Cerebral Connections of the Nerves. This is followed by an extensive bibliography of papers from 1900 on, with some of the earlier, more important ones. A comprehensive index completes the work. A distinct service has been rendered to ophthalmology by the author in bringing together in this one volume the mass of information which it contains. It will prove invaluable for one who wishes to review the part of our subject with which it deals, and should be diligently studied by the beginner.

C. L.

When Robert W. Doyne, with the support of Sir William Osler, established the course at Oxford University, leading to a Diploma in Ophthalmology, no one could foresee in how many ways it would contribute to the development of ophthalmic science. That course differed from the graduate courses preiously offered by giving a prominent place to study of the fundamental branches, anatomy, physiology and pathology. The teachers of these branches found a lack of textbooks suited to this purpose, and as a result three very important works have been added to our literature. Arthur Thomson, the Professor of Anatomy, published his Anatomy of the Human Eye with its stereoscopic plates; George J. Burch, teaching physiology wrote his book on Practical Exercises in Physiological Optics; and now we learn

that the work before us "originally formed the substance of a series of lectures given to candidates for the Oxford Diploma of Ophthalmology."

Few of us can ever attend the course at Oxford, or either of the systematic courses that are now being given in American institutions; but every one engaged in ophthalmic practice may obtain and carefully read this work. By so doing he will improve his equipment for practice, in a point in which he will find it was particularly weak.

Even one who has given some especial attention to the anatomy of the human orbit, and has made several dissections of the parts, finds much in this work that is new and suggestive. Much excellent investigation has been devoted to the anatomy of the orbit; but no work hitherto published has brought its results together. For the most part these have been buried in journals and transactions devoted to anatomy and physiology; and those who could make practical use of the observations have not known of their existence.

Of the 195 illustrations, mostly original, not one shows an instrument or piece of apparatus bearing the author's name. It is a surprise to find how much of importance such illustrations can teach. In some of them a whole lesson stands out at a glance; as in the photographs of the surface of the orbital region, pp. 8 and 171, on which are outlined the important deeper structures, in such a way as to show their relations to surface landmarks at once, and impress them clearly on the memory.

While part IV, the cerebral connections of the nerves, takes the reader out of the orbit, and is properly termed an appendix, it admirably supplements the account of the nerves given in the preceding part, on the orbital contents. Largely by means of the 8 illustrations it contains, it gives in 18 pages a very clear conception of the intricate anatomic arrangement of the visual and ocular motor nerve tracts.

On every account we welcome this addition to ophthalmic literature.

E. J.

Transactions of the Pacific Coast Oto-Ophthalmological Society. Ninth annual meeting at Seattle, Wash., July, 1921. Paper cover, 155 pages. Published by authority of the Executive Committee. [See also p. 241.]

This society is the organization of the ophthalmologists of seven states, having an area greater than that of the combined European countries, Great Britain and Ireland, France, Germany, Belgium, Holland, Denmark, Switzerland and Italy; with seven cities of over 100,000 population each; and a population better able to support good ophthalmologists than that of any country of Europe. This region is new and lacks scientific institutions; but it has some of the best trained ophthalmologists in the world, and some of their best scientific observations are published in these transactions. It ought not to surprise us to find here as good papers and discussions as appear in any society proceedings.

Printed in type of the same size, with an equal number of illustrations, this volume would be about the same size as that of the American Ophthalmological Society transactions. Of the papers and discussions, about one-third refer to matters of ophthalmic interest, rather less to oto-laryngology, and nearly half are of interest in both of those special branches. The absence of any table of contents or index constitutes a very grave defect for this volume of transactions, that should be useful as a work of reference.

E. J.

Diseases of the Eye. Ninth Edition, by **George E. de Schweinitz,** M.D., L.L.D., Prof. of Ophthalmology in the University of Pennsylvania, etc. 832 pages, 415 illustrations, with 7 colored plates. Philadelphia and London. W. B. Saunders Co.

We refer again to this work (see v. 4, p. 786) to illustrate a lesson taught by every text book that runs thru many editions, and maintains its position as a standard authoritative work covering its department of medicine. Such a

book does not continue to sell, successive editions are not called for, simply because it was the best book on the subject. It is kept the best book by the author and publisher going thru the labor of preparing and putting forth successive editions.

Ophthalmology is progressing and developing. Only by closely following its progress and development could any book keep the hold on the interest of the profession, that this one has kept for thirty years. If all the text books continued to reflect the present state of the knowledge and literature of their departments of medicine, the profession at large would be less dependent on year books and abstracts for the recent advances with which it is a duty to be familiar.

E. J.

Transactions of the College of Physicians of Philadelphia, Third Series, Volume 42, 1920, Edited by Walter G. Elmer, 548 pages, illustrated. Published by the College.

This volume interests our readers as containing the proceedings of the Section on Ophthalmology, which have already been published from month to month in this JOURNAL. These proceedings occupy about one-sixth of the volume. In addition to these, there are two papers on arteriosclerosis that are of value to the ophthalmologist who has to bear this condition in mind, in all his ophthalmoscopic examinations of patients past middle life. There are also three papers on recent therapeutic advances.

But this volume is most notable for five papers on Sir William Osler by McCrea, Hare, Burr, Packard and Norris, men who knew him from the days of his teaching in Montreal to his entertainment of American officers at Oxford near the close of his life. Of equal interest to a smaller circle of readers is a similar series of papers regarding Horatio C. Wood, by de Schweinitz, Dercum, Hare and Mills, with a posthumous "Reminiscences of an American Pioneer in Experimental Medicine" by Professor Wood himself.

E. J.

BIOGRAPHIC NOTICE.

FREDERICK PINSENT MAYNARD.

The three great lights of British Indian Ophthalmology have left India; and one, our distinguished confrère, Lt. Col. Maynard, has finished his earthly life, passing away at Audlem, Cheshire, England, Sept. 30, 1921. He had recently retired from the Indian Medical Service and going to England, practiced at Crewe. He and his wife had made arrangements to attend the International Ophthalmological Congress this year in Washington, and after that to tour America, visiting a number of his old friends in the profession.

It is sad to think that so gentle a philanthropist, in the direct sense *amicus humani generis,* should be denied the green autumn of ease and the dignity which he had earned by his splendid service in Calcutta; and especially not to have been given the opportunity to have further elaborated his most important contributions to ophthalmology. As with others of the Indian triumvirate, he had an exceptional opportunity in operative ophthalmology during service in India, having done over 14,000 cataract operations and thousands upon thousands of others.

Perhaps he was best known for his work on Glaucoma. In addition to this in 1908 he published a most excellent book on Operative Ophthalmology, with a second edition in 1920. He also wrote many papers in medical channels, contributing from time to time to the American Journal of Ophthalmology. He received the degree of M.B. Durh., with honors; D.P.H., Cambridge, and F.R.C.S., England.

His record in the Indian Medical Service was as follows:

1887 to 1892: Military duty, including Field Service Hazara (Black Mountain) 1891, medal and clasp.

1893 and 1894: Superintendent, Patna Opium Factory (2000 to 3000 work people in busy season).

1895 to 1901: Civil Surgeon of Ranchi, Hazaribagh, Patna and Darjeeling, (in charge of civil hospital and special eye wards).

1896: Medical Officer and Naturalist with the Baluch-Afghan Boundary Commission.

1902 to 1919: Professor of Ophthalmic Surgery, Medical College, and Ophthalmic Surgeon, Medical College Hospital, Calcutta (55 beds) and Surgeon Superintendent, Mayo Native Hospital, Calcutta (105 beds).

1908: On special duty to Lahore to attend His Majesty the late Amir Habibullah of Afghanistan, (as Ophthalmic Surgeon.)

1912: Coronation Medal, in connection with the visit of her Majesty, the Queen to the Medical College, Calcutta.

1908 to 1918: Fellow of the Calcutta University.

Aside from this he was a most delightful gentleman to meet. He was a high Mason, the jewel of his lodge being a beehive, its motto being industry and perseverence, which describes his character. He was fond of outdoor work and was noted as an apiarist. In his family relations he was most fortunate, his wife being his companion and interested in his medical vocation as well as in his other avocations. His daughter is a noted designer, having recently finished designing some of the new stamps for England. Personally we miss him, but for many years his name will be known in ophthalmology thru the printed words that he has left us.

HARRY VANDERBILT WUERDEMANN.

NEWS ITEMS

Personals and items of interest should be sent to Dr. Melville Black, 424 Metropolitan Building, Denver, Colorado. They should be sent in by the 25th of the month. The following gentlemen have consented to supply the news from their respective sections: Dr. Edmond E. Blaauw, Buffalo; Dr. H. Alexander Brown, San Francisco; Dr. V. A. Chapman, Milwaukee; Dr. Robert Fagin, Memphis; Dr. M. Feingold, New Orleans; Dr. Wm. F. Hardy, St. Louis; Dr. Geo. F. Keiper, LaFayette, Indiana; Dr. Geo. H. Kress, Los Angeles; Dr. W. H. Lowell, Boston; Dr. Pacheco Luna, Guatemala City, Central America; Dr. Wm. R. Murray, Minneapolis; Dr. G. Oram Ring, Philadelphia; Dr. Chas. P. Small, Chicago; Dr. John E. Virden, New York City; Dr. John O. McReynolds, Dallas, Texas; Dr. Edward F. Parker, Charleston, S. C.; Dr. Joseph C. McCool, Portland, Oregon; Dr. Richard C. Smith, Superior, Wis.; Dr. J. W. Kimberlin, Kansas City, Mo.; Dr. G. McD. Van Poole, Honolulu; Dr. E. B. Cayce, Nashville Tenn.; Dr. Gaylord C. Hall, Louisville, Ky. Volunteers are needed in other localities.

DEATHS.

Dr. George A. Hill, Philadelphia, aged seventy, died January 23rd.

Dr. John Kurrus, New York City, aged fifty-six, died suddenly from heart disease, January seventeenth.

Dr. Louis H. Landman, Cincinnati, aged sixty-two, died January 26th, in Palestine, where he had gone to practice his profession among the Jewish colonists.

Dr. Lovell Moss, Gibraltar, died January 24th, as the result of an accident.

Dr. Charles Wray, of London, for 32 years a member of the Ophthalmological Society of the United Kingdom, died recently at the age of sixty-three.

PERSONAL.

Dr. Ralph I. Lloyd, of Brooklyn, has removed to 14 Eighth Avenue.

Dr. James C. Braswell, formerly with the Mayo Clinic, has located at Tulsa, Oklahoma.

Dr. Dean Ely Godwin, formerly of Houghton, Michigan, announces the opening of his offices at Long Beach, California.

Prizes in ophthalmology were awarded by the Cuban Medical Congress to Doctors Juan Santos Fernandez and J. M. Penichet.

Dr. Ruth Alexander has opened offices in the Alexander Young Building, Honolulu, and has limited her practice to eye, ear, nose and throat.

Dr. C. Duane Cobb has returned to his offices in the Physicians Building, Oakland, California, after an absence of three years spent in the clinics of Boston and New York.

Dr. A. O. Shaw, Ashland, Wisconsin, stopped over a few days in Honolulu. He is on his way to New Zealand, Australia, Philippine Islands, China, and Japan. He expects to be gone about six or eight months.

Dr. John E. Weeks, of New York City, is spending a month in Honolulu. He has been over to see the big volcano on Hawaii and expects to take several other trips to other islands while here. He is taking a much needed rest, and says this is the place to take it.

Dr. McCluney Radcliffe, of Philadelphia, has resigned as Attending Ophthalmic Surgeon to the Presbyterian Hospital, and was appointed Consulting Ophthalmologist to the same institution. Dr. H. Maxwell Langdon was appointed to fill the vacancy created by the resignation of Dr. McCluney Radcliffe.

Prof. Alfred Vogt, Director of the Ophthalmological Clinic of the University of Bâle, announces an eight days' course of instruction in the investigation of the living eye with the slit light, for September, 1922. Inquiries and requests for admission to the ophthalmological clinic, should be addressed to Mittlerestrasse, Bâle, Switzerland, before May thirty-first.

Dr. and Mrs. Casey Wood, accompanied by Dr. and Mrs. Harold Gifford, Mr. C. W. Davis, the American Consul, and Mr. Fred Shorey, of Montreal, spent the month of February in the Kaieteur, and even further in the interior, in British Guiana, for the purpose of making a study of the local birds. Dr. Wood returns to the United States in time to attend the International Ophthalmological Congress at Washington, in April.

SOCIETIES.

The eighteenth semi-annual session of the Sioux Valley Eye and Ear Academy was held at Sioux City, Iowa, January 24th, under the presidency of Dr. Frank I. Putnam, of Sioux Falls, South Dakota.

The February meeting and dinner of the Kansas City Eye, Ear, Nose and Throat Society was held at the Hotel Muehlebach. Dr. Joseph Lichtenberg presented a paper on "Glaucoma Following Eye Operations."

At the November 16, 1921, meeting of the Interurban (Duluth-Superior) Academy of Medicine, Dr. T. H. Shastid, of Superior, read a paper in appreciation of the late Dr. C. D. Conkey, who was the first physician in North Wisconsin to limit his practice exclusively to the eye, ear, nose and throat.

Dr. John E. Weeks, of New York City, was a visitor in San Francisco during January. He attended a meeting of the Eye, Ear, Nose and Throat Section of the San Francisco County Society, held at the University of California Hospital. The university staff was in charge of the meeting, and a very interesting program was given.

Under the auspices of the Ophthalmic Section of the St. Louis Medical Society, Professor Ernst Fuchs, of Vienna, gave a course of lectures during the month of February. This course was attended by sixty-one ophthalmologists from St. Louis, and thirty-there from other cities. Special ophthalmologic and oto-laryngologic clinics were held by the local men for the visiting physicians.

A section on ophthalmology of the Associated Out-Patient Clinics of New York was organized on January 24th, with the following officers: Dr. W. E. Lambert, chairman; Dr. E. S. Thomson, vice-chairman; Dr. Conrad Berens, secretary. The subject, "How Can We Best Regulate Refraction Work in Eye Clinics?" was discussed by Dr. E. S. Thomson, and "How Can the Admission of Patients Be Better Controlled?" by Dr. J. M. Wheeler.

The annual meeting and election of officers of the Puget Sound Academy of Ophthalmology and Oto-Laryngology was held at the University Club of Seattle, January 31, 1922. The following officers were elected to serve for the ensuing year: President, Dr. Frederick Adams, Seattle; first vice-president, Dr. D. H. Bell, Tacoma; second vice-president, Dr. Wm. G. Cameron, Tacoma; secretary, treasurer, Dr. John H. Harter, Seattle.

At the annual election of the Portland Academy of Ophthalmology and Oto-Laryngology the following officers were elected for 1922: President Dr. Gertrude French; vice-president, Dr. Ira E. Gaston; secretary-treasurer, Dr. Andrew Browning. Dr. J. L. McCool, Portland, Oregon, has been appointed chairman of a committee on entertainment for visiting ophthalmologists attending the International Congress of Ophthalmology, to be held in Washington, D. C., in April of this year.

The meeting of the Pacific Coast Oto-Ophthalmological Society will this year be held at Salt Lake City, Utah, September 14, 15, and 16. The time is chosen when this region is particularly attractive and when the members can proceed thence to the meeting of the American Academy of Ophthalmology and Oto-Laryngology at Minneapolis which begins September 19th. Ophthalmologists from other parts of the country, who can attend this interesting meeting, should communicate with the secretary, Dr. Edward D. LeCompte, Boston Building, Salt Lake City, Utah.

The eye, ear, nose and throat men of St. Joseph, Missouri, were hosts, on January 19th, to the Kansas City Eye, Ear, Nose and Throat Society, and also to men practicing these specialties from Chicago, Lincoln, Nebraska, Omaha, Topeka, Oklahoma City, Springfield, Missouri, Dover City, Iowa and other cities. A splendid operative and diagnostic clinic was held at the Noyes Hospital in the afternoon at which the local men operated as also did Dr. Joseph Beck, of Chicago; Drs. W. H. Schutz, Sam Roberts, and H. E. Thomason, of Kansas City. In the evening a medical dinner was given at the Benton Club, where papers were presented by Dr. W. P. Wherry, and Dr. James M. Patton, of Omaha. Drs. L. R. Forgrave, W. C. Proud, W. H. Minton, and E. C. Ambrose, of St. Joseph, were responsible for the clinic.

The annual meeting of the Indiana Academy of Ophthalmology and Oto-Laryngology was held in Indianapolis on January 18th and 19th, at the Claypool Hotel. There was a dinner and evening session the first day at which Dr. Harry Pollock, of Chicago, delivered an address on the "High Spots in Oto-Laryngology." Those who took part in the eye program the next day were Dr. George F. Keiper, of Lafayette; Dr. F. McKay Ruby, of Union City; and Dr. E. J. Lent, of South Bend. The newly elected officers are: President, Dr. Delbert O. Kearby, Indianapolis; first vice-president, Dr. George C. Knapp, Vincennes; secretary-treasurer, Dr. Bernard J. Larkin, Indianapolis.

MISCELLANEOUS.

The New York Association for the Blind received a bequest of $5,000 by the will of the late Ida Barth Iden.

The New York Ophthalmological Hospital was left $150,000 by the will of the late Commodore E. C. Benedict, of Greenwich.

Current Literature

These are the titles of papers bearing on ophthalmology received in the last three months. Later most of them will be noticed under Digest of the Literature. They are given ni English, some modified to indicate more clearly their subjects. They are grouped under appropriate heads, and in each group arranged alphabetically usually by the author's name in **heavy-face type.** The abbreviations mean: (Ill.) illustrations; (Pl) plates; (Col. Pl.) colored plates. Abst shows it is an abstract of the original article. (Bibl.) means bibliography and (Dis.) discussion published with a paper. Under repeated titles are given additional references to papers already noticed. To secure early mention copies of papers or reprints should be sent to 318 Majestic Building, Denver, Colorado.

DIAGNOSIS.

Dimmer, F. Ophthalmoscope and ophthalmoscopic diagnosis. Franz Deuticke, Leipzig and Vienna, 1921.

Koeppe, L. Normal histology of living eye. I. Anterior segment. Ergebn. d. Anat. u. Entwickl., 1921, v. 23, pp. 340-419.

Prosperi, G. Physiologic and professional visions. Rass. d. Prev. Soc., 1921, v. 8, p. 54-62.

Treutler. Testing of vision. Zeit. f. Bahn. u. Bahnkass., 1921, v. 16, pp. 2-9.

Waetzold, P. Estimation of blindness. Zeit. f. aerztl.-soz. Versorg., 1921, v. 1, pp. 12-21.

Wallace, W. Vision of soldier and malingering. Jour. Royal Army Med. Corps, 1921, v. 37, pp. 40-49; 109-126.

THERAPEUTICS.

Carbone. Vaccines and sera in ophthalmic therapy. Instit. Sieroterap., Milan, 1920, 130 pp.

Organotherapy in eye diseases. Instit. Sieroterap., Milan, 1920, 143 pp.

James, R. R. Collosol argentum. Brit. Jour. Sieroterap., Milan, 1920, 143 pp.

Kleefeld. Nitrat of silver in ophthalmology. Bull. de la Soc. Belge d'Opht., 1921, v. 44, p. 41.

LaFerla, A. Sterilized injections of milk in ocular therapeutics. Arch. di Ottal., 1921, v. 28, pp. 204-214.

Mazzei, A. Milk in ocular therapeutics. Arch. di Ottal, 1921, v. 28, pp. 131-154.

Schmidt, P. Milk injections in ocular affections. Klin. M. f. Augenh., 1921, p. 281.

Toulant. Pomades in ocular therapeutics. Soc. d'Opht. de Paris, Jan., 1922. Ann. d'Ocul., 1922, v. 159, p. 155.

Repeated titles. **Goldschmidt, M.** (O. L., 1921, v. 17, p. 541). A. J. O., 1922, v. 5, p. 156. **Loehlein.** (A. J. O., 1922, v. 5, p. 162). J. A. M. A., 1922, v. 78, p. 553.

OPERATIONS.

Holth, S. Transitory paralysis of lids in eye operation. Zeit. f. d. Norw. Aerztever., 1921, pp. 649-659.

Jackson, E. Butyn, a new local anesthetic. A. J. O., 1922, v. 5, p. 148.

Magitot. Use of cartilage after long period. Soc. d'Opht. de Paris, Nov., 1921. Ann. d'Ocul., 1922, v. 159, p. 75.

Schutz, W. H. Modern anesthetist in eye, ear, nose and throat surgery. Eye, Ear, Nose and Throat Mo., 1922, v. 1, p. 53.

Van Lint. Oculopalpebral fixation forceps. (1 ill.) Bull. de la Soc. Belge d'Opht., 1921, v. 44, p. 38.

Repeated titles. **Holland,** (O. L., 1921, v. 17, p. 542). A. J. O., 1922, p. 158.

PHYSIOLOGIC OPTICS.

Brown, E. J. Subjective ocular experiences. A. J. O., 1922, v. 5, p. 128.

Froehlich, F. W. Influence of light and dark adaptation on course of periodic after images. Zeit. f. Sinnesphys. 1921, v. 53, pp. 79-107.

Gelhorn, E. Relation of tactile space and depth vision. Zeit. f. d. g. Neur. u. Psychiat, 1921, v. 72, p. 267-268. Abst. Amer. Inst. Med., Feb. 22, 1922, p. 84.

Harford, C. F. Psychology and problems of vision. Proc. Royal Soc., Sec. on Ophth. A. J. O., 1922, v. 5, p. 139.

Lau, E. New investigations on surface and depth vision. Zeit. f. Sinnesphys., 1921, v. 53, pp. 1-35.

Lohmann, W. Rhythmic phenomena in eye disease. Münch. med. Woch., 1920, v. 67, p. 625. J. A. M. A., 1920, v. 75, p. 904.

Rochon-Duvigneaud. Vision from anatomic and physiologic standpoint. Arch. d'Opht., 1922, v. 39, pp. 117-123.

Weigert, F. Photochemic model of retina. Pflueger's Arch. f. d. g. Phys., 1921, v. 190, pp. 117-197.

REFRACTION.

Clarke, E. Milestones in refraction work. Practitioner (London), 1922, v. 108, pp. 119-130.

Dzen Tswang. Refraction in Peking Union Medical College. Natl. Med. Jour. China, 1921, v. 7, pp. 206-218.

Escourt-Oswald, A. Emergency method in presbyopia and hypermetropia. Brit. Med. Jour., Jan. 28, 1922, p. 140.

Gleichen, A. Largon glass. Zent.-Zeit. f. Opt. u. Mech., 1921, v. 42, pp. 454-455.

Greeff, R. Notation of axes of cylinders. Deut. opt. Woch., 1921, v. 7, p. 900.

Thread frames. Deut. opt. Woch., 1920, p. 2.

Hanssen, R. Genesis of myopia. Klin. M. f. Augenh., 1921, v. 67, p. 171.

Henker, O. Largon and punktal glasses. Zent.-Zeit. f. Opt. u. Mech., 1921, v. 42, pp. 469-471.

Houser, O. J. Etiology and treatment of errors of refraction. Southern Med. and Surg. Jour., Feb., 1922, p. 73.

Kuehl, A. Largon lenses. Zent.-Zeit. f. Opt. u. Mech., 1921, v. 42, pp. 453-454; 506-507.

Simple apparatuses useful in prescribing glasses. Zent.-Zeit. f. Opt. u. Mech., 1921, v. 42, pp. 405-407.

Marbaix. Spasm of accommodation. Clin. Opht., 1921, v. 25, pp. 663-666.

Mettelstrass, B. Tension tester of lenses. Deut. opt. Woch., 1921, v. 7, pp. 780-782.

Morax, V. Control of prescribing of glasses by oculists. Soc. d'Opht. de Paris., Jan., 1922. Ann. d'Ocul., 1922, v. 159, p. 155.

Rodenstock, A. Complete correction of high myopia. Deut. opt. Woch., 1921, v. 7, pp. 741-743.

Rohr, M. v. Largon glasses. Zent.-Zeit. f. Opt. u. Mech., 1921, v. 42, pp. 471-473.

Scrini and Fortin. Practical manual for choice of glasses and lunettes in examination of vision. 49 ill., Paris, 1922. Vigot. Ann. d'Ocul., 1922, v. 159, p. 157.

Wannamaker, T. E., Jr. Fitting eyeglasses and spectacles. South Carolina Med. Assn. Jour., 1922, v. 18, pp. 334-336.

Weiss, E. Largon glasses. Zent.-Zeit, f. Opt. u. Mech., 1921, v. 42, pp. 491-492.

OCULAR MOVEMENTS.

Bard, L. Reflexes of direction of eyes. Arch. d'Opht., 1922, v. 39, pp. 5-21.

Carsten, P. Operation for convergent strabismus. Zeit. f. Augenh., 1922, v. 47, p. 26-30.

Delogé, C. Treatment of strabismus. Brit. Jour. Ophth., 1922, v. 6, pp. 104-110.

Demetriades, T. D. Investigations on optic nystagmus. Monats. f. Ohr. u. Lar.-Rhin., 1921, v. 55, pp. 314-319.

Duran Arrom. Sclerosis and oculomotor disturbance. España Oft., 1922, v. 7, p. 7-10.

Gjessing, H. G. A. Nystagmus. Zeit. f. d. Norw.-Aerzt., 1921, v. 19, pp. 807-816.

Gutzeit, R. Right ophthalmoplegia from injury to left upper lip. Zeit. f. Augenh., 1922, v. 47, pp. 42-46.

Kidd, L. J. Fourth cranial nerve. (bibl.) Brit. Jour. Ophth., 1922, v. 6, pp. 49-65.

Lewis, A. C. Transient squint, encephalitis. (dis.) A. J. O., 1922, v. 5, pp. 133-134.

Magruder, A. C. Congenital paralysis of external rectus. (dis.) A. J. O., 1922, v. 5, p. 136.

Marin Amat, M. Operation for strabismus after Castresana. Arch. de Oft. Hisp.-Amer., 1922, v. 22, pp. 26-29.

Percival, A. S. Treatment of squint. Brit. Med. Jour., Feb. 4, 1922, p. 209.

Polliot. Projection images in binocular vision. (7 ill.) Arch. d'Opht., 1922, v. 39, pp. 83-107.

Rasmussen, C. End results of strabismus operations after 15 years. Trans. Dansk. Oft. Siesk., 1922, p. 1.

Rugg-Gunn, A. Treatment of squint. Brit. Med. Jour., Feb., 18, 1922, p. 290.

Terrien, F. Traumatic ophthalmoplegia. (2 ill.) Arch. d'Opht., 1922, v. 39, pp. 74-82.

Wipper, O. Determining muscle power. A. J. O., 1922, v. 5, pp. 127-128.

Repeated titles. **Hairi, H.** (O. L., 1921, v. 17, p. 408) Brit. Jour. Ophth., 1922, v. 6, p. 128.

CONJUNCTIVA.

Argañaraz, R. Pinguecula and pterygium. Semana Méd., 1922, v. 29, p. 230.

Dupuy-Dutemps. Serotherapy in gonoccocic conjunctivitis. Ann. d'Ocul., 1922, v. 159, pp. 65-69.

Duverger. Purulent conjunctivitis treated by Sterian serum. Soc. d'Opht. de Paris, Jan., 1922. Ann. d'Ocul., 1922, v. 159, p. 155.

Falta, M. Resection of trachomatous conjunctiva. Orvosi Hetil., 1921, v. 65, p. 321.

Glăvan, I. Blepharokeratoconjunctivitis "eczematosa." Clujul Med., 1921, v. 2, pp. 207-212.

Gonzalez, J. de J. Exuberant perikeratoconjunctivitis. (1 col. pl.) Anales de la Soc. Mex. de Oft. y Oto-Rino-Larin., Oct., 1921, pp. 73-84.

Gradle, H. S. Bactericidal agent for use in conjunctival sac. Ill. Med. Jour., 1922, v. 41, p. 193.

Kassner, H. Scrofulous eye disease during the war. Graefe's Arch. f. Ophth., 1921, v. 104, p. 337.

Klein-Baeringer, S. Permanent result after jequirity treatment. Med. Klin., 1921, v. 17, pp. 1265-1266.

Majewski, C. Granular conjunctivitis in Pologne. Presse. Méd., Nov. 16, 1921. Abst. Ann. d'Ocul., 1922, v. 159, p. 77.

Marin Amat, M. Treatment of trachoma in Almeria. Arch. de Oft. Hisp.-Amer., 1921, v. 21, pp. 637-665.

Mawas. Treatment of blennorrhagic conjunctivitis. Soc. d'Opht. de Paris, Nov., 1921. Ann. d'Ocul., 1922, v. 159, p. 75.

Michail, D. Pathogenesis of trachoma recurrences. Clujul Med., 1921, v. 2, pp. 71-75.

Popovici, V. Ocular phlyctenulosis and lichen scrofulosis. Clujul Med., 1921, v. 2, pp. 221-222.

Rush, C. C. Treatment of trachoma. China Med. Jour., v. 35, p. 211. Abst., A. J. O., 1922, v. 5, p. 159.

Sichel, A. W. S. Conjunctivitis in relation to rainfall. South African Med. Rec., 1921, v. 9, p. 470. Abst. J. A. M. A., 1922, v. 78, p. 546.

Terrien, F. Diagnosis and treatment of conjunctivitis. Presse Méd., 1922, Jan. 28, p. 163.

Waddy, R. G. Parasitic conjunctivitis. Med. Jour. Australia, Feb. 4, 1922, p. 127.

Weekers, L., and Colmant, Y. Ocular phlyctenules with tracheobronchi adenopathy. (4 ill.) Arch. d'Opht., 1922, v. 39, pp. 65-73.

Wright, R. E. Rhinosporidium of conjunctiva. Indian Med. Gaz., 1922, v. 57, p. 6.

Repeated titles. **Kooy** (O. L., 1921, v. 17, p. 112) A. J. O., 1922, v. 5, p. 156.

THE CORNEA AND SCLERA.

Burnham, G. H. Variolus inflammation of cornea. (bibl.) A. J. O., 1922, v. 5, pp. 123-124.

Fagin, R. Corneal ulcer. A. J. O., 1922, v. 5, p. 135.

Gallemaerts. Gummatous scleritis. Bull. de la Soc. Belge d'Opht., 1921, v. 44, p. 30.

Jackson, E. Naming and classification of corneal diseases. A. J. O., 1922, v. 5, pp. 146-147.

Kraupa, E. Folds in Descemet's membrane with megalocornea and hydrophthalmos. (10 ill. bibl.) Graefe's Arch. f. Ophth., 1921, v. 107, pp. 30-48.

Pathogenesis of parenchymatous keratitis and neuropathic constitution. Klin. M. f. Augenh., 1921, v. 67, p. 218.

Landolt, M. Pupil inequality after trephining. Ann. d'Ocul., 1922, v. 159, pp. 158-160.

Magruder, A. C. Episcleritis. (dis.) A. J. O., 1922, v. 5, p. 137.

Neeper, E. R. Whether to operate for anterior synechia. (dis.) A. J. O., 1922, v. 5, p. 136.

Rubbrecht. Ectatic marginal dystrophy of cornea. Bull. de la Soc. Belge d'Opht., 1921, v. 44, p. 35.

Salvati. Deepseated marginal keratitis with grippe. Ann. d'Ocul., 1922, v. 159, pp. 125-130.

Sannow, K. Peroxid of hydrogen in treatment of corneal affections. Klin. M. f. Augenh., 1921, v. 67, p. 272.

Wolfrum and Boehing. Corneal regeneration. Graefe's Arch. f. Ophth., 1921, v. 104, p. 175.

Repeated titles. **Wernicke, O.** (O. L., 1921, v. 17, p. 547) A. J. O., 1922, v. 5, p. 155.

THE ANTERIOR CHAMBER AND PUPIL.

Babonneix, L. Unilateral dilation of pupil in infantile paralysis. Gaz. d. Hôp. Civ. et Mil., 1921, v. 94, pp. 85-88.

Danis, M. Examination of aqueous in siderosis bulbi. Bull. de la Soc. Belge d'Opht., 1921, v. 44, p. 45.

Fisher, W. A. Operation for drawn up pupil. A. J. O., 1922, v. 5, p. 129.

Fracassi, G. Action of extract of endocrin glands and alkaloids on size of pupil in rabbit and frog. Arch. di Ottal., 1921, v. 28, pp. 154 and 204.

Haan, J. de and Creveld S. van. Relation between blood plasma and fluids of eye. Versl. der Afdeeling Natuur. Koengl. Acad. d. Wiss. Amsterdam, 1921, v. 29, pp. 1238-1251. Biochem. Zeit., 1921, v. 123, pp. 190-214.

Heine, L. Pathology of pupillary disturbances. Graefe's Arch. f. Ophth., 1921, v. 104, p. 224.

Neeper, E. R. Anterior polar cataract and persistent pupillary membrane. Muscular anomaly. (dis.) A. J. O., 1922, v. 5, p. 135.

Rochon-Duvigneaud. Refractive media of aqueous humor in horned owl and man. Soc. d'Opht. de Paris, Nov., 1921. Ann. d'Ocul., 1922, v. 159, p. 75.

Seidel, E. Source and course of intraocular fluids. (1 ill.) Graefe's Arch. f. Ophth., 1921, v. 104, pp. 284 and 403; v. 107, pp 101 and 105.

Evacuation of aqueous humor from anterior chamber. Graefe's Arch. f. Ophth., 1921, v. 104, p. 357 and 403.

Touzet Anisocoria of gastric origin. Arch. d'Opht., 1922, v. 39, pp. 44-48.

Vossius, A. Blood vessels of persistent pupillary membrane. Graefe's Arch. f. Ophth., 1921, v. 104, p. 320.

Repeated titles. **LeBoucq.** (O. L., 1921, v. 17, p. 263) A. J. O., 1922, v. 5, p. 158.

THE UVEAL TRACT.

Clegg, J. G. Central scotoma in anterior uveitis. (4 ill.) Brit. Jour. Ophth., 1922, v. 6, pp. 118-125.

Doyne, R. C. Abnormality in iris. Proc. Royal Soc., Sec. on Ophth. A. J. O., 1922, v. 5, p. 138.

Fuchs, E. Serous choroid detachment. Graefe's Arch. f. Ophth., 1921, v. 104, p. 468.

Chorioretinitis. Graefe's Arch. f. Ophth., 1921, v. 107, pp. 15-25.

Jennings, C. W. Infection in relation to ocular disease. Penn. Med. Jour., 1922, v. 25, p. 418.

Koby, F. E. Rare form of acute macular chorioretinitis. (1 ill. bibl.) Arch. d'Opht., 1922, v. 39, pp. 36-43.

Magruder, A. C. Atrophy of iris. (dis.) A. J. O., 1922, v. 5, p. 135.

Michail, D. Mechanical factor in pathogenesis of late postoperative iridocylitis. Clujul Med., 1921, v. 2, pp. 174-176

Ten Cate, J. Automatic movements of isolated iris. Ver. d. Afd. Natur., Koengl. Akad. d. Wiss., Amsterdam, 1921, v. 30, pp. 143-144.

Repeated titles. **Leplat.** (O. L., 1921, v. 17, p. 114) A. J. O., 1922, v. 5, p. 157.

GLAUCOMA.

Abadie. Juvenile glaucoma. Soc. d'Opht. de Paris. Jan., 1922. Ann. d'Ocul., 1922, v. 159, p. 154.

Bickerton, T. H. Operative treatment of chronic simple glaucoma. Trans. Ophth. Soc. United Kingdom, 1921, v. 41, p. 492.

Bleiker, H. Choked disc in glaucoma simplex. Klin. M. f. Augenh., 1921, v. 67, p. 249.

Charlin, C. Vascular state in the glaucomatous. Ann. d'Ocul., 1921, v. 158, pp. 861-912.

Elliot, R. H. Holth's iridencleisis. Brit. Jour. Ophth., 1922, v. 6, p. 141.

Grimsdale, H., and Brewerton, E. Holth's iridencleisis. Brit. Jour. Ophth., 1922, v. 6, p. 89.

Hagen, S. Interchange of intraocular fluids. Klin. M. f. Augenh., 1921, v. 67, p. 259.

Hepburn, M. L. 140 trephine operations for glaucoma. Brit. Jour. Ophth., 1922, v. 6, pp. 97-104. Med. Press and Circ., 1922, v. 113, pp. 66-68.

Herbert, H. After treatment of small flap sclerectomy. Brit. Jour. Ophth., 1922, v. 6, p. 65.

Nida. Glaucoma and cataract. Soc. d'Opht. de Paris, Jan., 1922. Ann. d'Ocul., 1922, v. 159, p. 153.

Popovici, V. Treatment of primary glaucoma in ophthalmic clinic at Cluj in 1920. Clujul Med., 1921, v. 2, pp. 248-252.

Rochon-Duvigneaud, and Besnard, C. Iridosclerectomy and result of Elliot's trephining in various forms of glaucoma. (2 ill.) Ann. d'Ocul., 1922, v. 159, pp. 81-116.

Smith, H. Simple chronic glaucoma. Practitioner (London), 1922, v. 108, pp. 131-136.

Spital, G. Elliot trephining in secondary glaucoma with iritis and in buphthalmos. Graefe's Arch. f. Ophth., 1921, v. 107, pp. 92-100.

Repeated titles. **Bonnefon.** (A. J. O., 1920, v. 3, p. 914) A. J. O., 1922, v. 5, p. 156. **Rossi.** (A. J. O., 1922, v. 5, p. 165) Brit. Jour. Ophth., 1922, v. 6, p. 132.

THE CRYSTALLINE LENS.

Fergus, F. Hematemesis after cataract extraction. Brit. Med. Jour., 1922, p. 54.

Findlay, E. K. Cataract operations performed by Col. Smith. (dis.) A. J. O., 1922, v. 5, pp. 130-133.

Frisch, F. Method of preventing loss of vitreous. (1 ill.) A. J. O., 1922, v. 5, pp. 81-82.

Green, A. S., and Green, L. D. Vacuum method of intracapsular cataract extraction. A. J. O., 1922, v. 5, pp. 92-96.

McDa nald, C. E. Vacuum extraction of cataract. (1 ill.) A. J. O., 1922, v. 5, pp. 90-92.

McReynolds, J. O. Complete dislocation of lens into vitreous. Dallas Med. Jour., Feb., 1922, p. 36.

Prof. Barraquer of Barcelona and his method of phakoerisis. (7 ill.) A. J. O., 1922, v. 5, pp. 82-90.

Marbaix. Barraquer's operation. (1 ill. dis.) Bull. de la Soc. Belge d'Opht., 1921, v. 44, pp. 20-30.

Palacios, A. Congenital subluxation or bilateral ectopia lentis. Pediat. España, 1921, v. 10, pp. 276-278.

Pfeiffer, C. E. Fissures in senile lens with slit lamp microscopy in healthy persons. (13 ill. bibl.) Graefe's Arch. f. Ophth., 1921, v. 107, pp. 71-91.

Schild, H. Lamellar segment in the posterior and anterior lens cortex. Graefe's Arch. f. Ophth., 1921, v. 107, pp. 49-60.

Smith, H. Early senile cataract. Pacific Coast Oto-Ophth. Soc., 1921, p. 68.

Earliest stage of senile cataract. Lancet., Feb. 4, 1922, p. 223.

Veasey, C. A. Extraction of senile cataract. Pacific Coast Oto-Ophth. Soc., 1921, pp. 37-47.

Weekers, L. Operation of Barraquer. Bull. de la Soc. Belge d'Opht., 1921, v. 44, pp. 16-20.

Zentmayer, W. Cataract operations performed by Col. Henry Smith, at Wills Hospital, Philadelphia. (1 table) A. J. O., 1922, v. 5, pp. 97-98.

THE VITREOUS HUMOR.

Holloway, T. B. Snowball vitreous opacities. (bibl.) A. J. O., 1922, v. 5, pp. 100-105.

Suker, G. F. Patent hyaloid artery. A. J. O., 1922, v. 5, p. 129.

Von Der Heydt, R. Physiologic hyaloid artery remnants. A. J. O., 1922, v. 5, pp. 125-127.

Wirth, M. Hyphema in postlenticular space. (3 ill. bibl.) Zeit. f. Augenh., 1922, v. 47, pp. 1-10.

Z'Brun, T. Senile changes in vitreous in healthy persons. (bibl.) Graefe's Arch. f. Ophth., 1921, v. 107, pp. 61-70.

THE RETINA.

Bachman, R. Atrophy of medullated nerve fibres in retina after embolus of central artery. (3 ill.) Graefe's Arch. f. Ophth., 1921, v. 107, pp. 10-14.

Brav, A. Subretinal cyst. Eye, Ear, Nose and Throat Mo., 1922, v. 1, p. 61.

Crume, J J. Albuminuric retinitis. Texas State Jour. Med., 1922, v. 17, p. 491.

Demaria, E. B. External exudative retinitis. (9 ill.) Arch. de Oft. Hisp.-Amer., 1922, v. 22, pp. 1-26.

Dittler, R. Space function of retina in its relation to position, sensation of eye, and labyrinth. Zeit. f. Psych. u. Phys. d. Sinnesorg, 1921, v. 52, pp. 274-310.

Fagin, R. Chorioretinitis. (dis.) A. J. O., 1922, v. 5, p. 134.

Intraocular hemorrhage. (dis.) A. J. O., 1922, v. 5, p. 134.

Fuchs, E. Displacement of retina and papilla. Graefe's Arch. f. Ophth., 1921, v. 104, p. 230.

Gaudissart, P. Hypercholesterinemia and albuminuric retinitis. (4 tables, bibl.) A. J. O., v. 5, pp. 118-122.

Kuemmell, R. Detachment of retina. Klin. M. f. Augenh., 1921, v. 67, p. 180.

Marinesco, G. Amaurotic idiocy. Encéphale, 1921, v. 16, p. 561. Abst. J. A. M. A., 1922, v. 78, p. 688.

Salvati. Retinal arterial pressure sitting and lying down. Ann. d'Ocul., 1922, v. 159, pp. 69-71.

Schiötz, I. Gravidic retinitis and eclamptic amaurosis. Klin. M. f. Augenh., 1921, v. 67. Beilgeh. F. Enke, 1921.

Terrien, F. Attenuated forms of retinitis nephritica. Presse Méd., 1921, v. 29, pp. 673-675.

Uhthoff, W. Etiology and treatment of retinal detachment. Deut. med. Woch., 1922, v. 48, pp. 115-118.

Valude, and Gallois. Spasm of central retinal artery. Soc. d'Opht. de Paris, Jan., 1922. Ann. d'Ocul., 1922, v. 159, p. 154.

Williamson, F. A. Thrombosis of retinal vein, hole and star in macula. (4 ill.) Brit. Jour. Ophth., 1922, v. 6, pp. 67-74. Proc. Royal Soc. Med., Sec. on Ophth. A. J. O., 1922, v. 5, p. 139.

Repeated titles. **Behr.** (O. L., 1921, v. 17, p. 414) A. J. O., 1922, v. 5, p. 157.

TOXIC AMBLYOPIAS

Du Toit, J. S. Quinin amaurosis. South African Med. Rec., 1922, v. 20, p. 8.

THE OPTIC NERVE.

Carpenter, E. R. Etiology of optic nerve atrophy. (3 ill.) Dallas Med. Jour., 1922, Feb., p. 37.

King, J. J. Total blindness of both eyes cured by drainage of sphenoid and ethmoid cells. J. A. M. A., 1922, v. 78, p. 508.

Merigot de Treigny and Iconomopoulos. Cranial malformation and double papillary stasis. Soc. d'Opht. de Paris, Jan., 1922. Ann. d'Ocul., 1922, v. 159, p. 153.

Schmiegelow, E. Papilledema in mastoiditis without cranial complications. Trans. Dansk. Oto-Laryn. Selsk. 1922, p. 3.

Sidler-Huguenin. Choked disc with tetany. Graefe's Arch. f. Ophth., 1921, v. 107, pp. 1-10.

Terson. Visual disturbances with hemorrhage. Ann. d'Ocul., 1922, v. 159, pp. 13-25 and 73. Abst. Med. Rec., 1922, v. 101, p. 285.

Tornatola, S. Polioencephalitis and papillitis. Gior. di Clin. Med., 1921, v. 2, pp. 297-300.

Van Duyse, G. M. Fissural coloboma at optic nerve entrance. (2 ill.) Bull. de la Soc. Belge d'Opht., 1921, v. 44, pp. 14-16.

White, L. E. Aeration of posterior accessory sinuses in acute optic neuritis. Boston Med. and Surg. Jour., 1922, v. 186, pp. 172-180.

VISUAL TRACTS AND CENTERS.

Benjamin, J. E. Normal fields in acromegaly. J. A. M. A., 1922, v. 78, pp. 499-502.

Blumenthal, F., and Tugendreich, J. Favorable action of x-ray on tumor of skull. Fortsch. a. d. Geb. d. Roentgenstr., 1921, v. 28, p. 130.

Carlotti. Hypophysis tumors and visual troubles. Radiotherapie. (6 ill. bibl.) Ann. d'Ocul., 1922, v. 159, pp. 1-22.

Hirsch, O. Eye symptoms in tumors of hypophysis and similar clinical aspects. Zeit. f. Augenh., 1921, v. 45, p. 294.

Koch, K. Cerebral tumor without symptoms for 10 years; puncture of corpus callosum. Klin. M. f. Augenh., 1921, v. 67, p. 286.

Mayendorf, N. v. Socalled optic radiations. Graefe's Arch. f. Ophth., 1921, v. 104, p. 293.

Miller, R. v. Hypophysis cyst and genital adiposis dystrophy. (6 ill.) Virchow's Arch. f. path. Anat. u. Phys. u. f. Klin. Med., 1922, v. 236, pp. 207-225.

Roger and Reboul-Lachaux. Visual aura with brain lesion. Encéphale, 1921, v. 16, p. 573. J. A. M. A., 1922, v. 78, p. 688.

Schaeffer, J. P. Visual pathway and paranasal sinuses. A. J. O., 1922, v. 5, p. 105.

COLOR VISION.

Clausen. Inheritance of color blindness. Deut. opt. Woch., 1921, v. 7, pp. 544-546.

Edridge-Green, F. W. Merchant shipping standard of rejection for color blindness in seamen. Brit. Jour. Ophth., 1922, v. 6, pp. 126-128.

Researches on color vision. Lancet, Feb. 25, 1922, pp. 357-361.

Gildemeister, M., and Dieter, W. Recognition of unequal colors. Graefe's Arch. f. Ophth., 1921, v. 107, pp. 26-29.

Sonnenfeld. Ostwald's method of color measurement. Zeit. f. ophth. Opt., 1921, v. 9, pp. 131-134.

Tests for color blindness in seamen. Brit. Med. Jour., Jan. 28, 1922, p. 155.

THE EYEBALL.

Fischel, A. Normal and abnormal development of eye. Arch. f. Entwickel. d. Organ., 1921, v. 49, pp. 383-462.

Mazzei, A. Congenital, bilateral microphthalmus. Folia Med., 1921, v. 7, pp. 439-442.

Steiner, O. Implantation of fat after enucleation and exenteration. Klin. M. f. Augenh., 1921, v. 67, p. 267.

Van Duyse. Congenital, cystic retinal neoplasm with anophthalmos. Bull de la Soc. Belge d'Opht., 1921, v. 44, p. 46.

THE LACRIMAL APPARATUS.

Beauvieux and Pesme, P. Tuberculosis of lacrimal gland. (bibl.) Arch. d'Opht., 1922, v. 39, pp. 22-35.

Cowper, H. W. Symmetric cystic enlargement of lacrimal glands due to syphilis. A. J. O., 1922, v. 5, p. 125.

Fava, A. Primary streptothricosis of lacrimal sac. (3 ill. bibl.) Ann. d'Ocul., 1922, v. 159, pp. 117-125.

Gras Rebull. Neoplasm of region of lacrimal sac. Siglo Méd., 1921, v. 68, p. 921.

Lange, W. Toti operation on lacrimal sac. Deut. med. Woch., 1921, v. 47, pp. 1557-1559.

Mosher, H. P. Intranasal drainage of lacrimal sac. Pacific Coast Oto-Ophth. Soc., 1921, pp. 47-67.

DISEASES OF THE LIDS.

Birch-Hirschfeld, A. Simple operation for paralytic ectropion and spastic entropion by shifting of bundle of orbicularis. Klin. M. f. Augenh., 1921, v. 67, p. 265.

Duverger. Plastic operation for coloboma of lids. Soc. d'Opht. de Paris, Jan., 1922. Ann. d'Ocul., 1922, v. 159, p. 155.

Elewaut. Chancres of lids. Bull. de la Soc. Belge d'Opht., 1921, v. 44, p. 33.

Guillain, G. Contraction of lids caused by voluntary occlusion of eyes. Soc. de Neur., Jan., 1922. Abst. Gaz. des Hôp., 1922, v. 95, p. 107.

Neame, H. Cyst of Krause's gland. Proc. Royal Soc. Med., Sec. on Ophth. A. J. O., 1922, v. 5, p. 137.

Poulard. Surgical treatment of coloboma of lid. Soc. d'Opht. de Paris, Nov., 1921. Ann. d'Ocul., 1922, v. 159, p. 75.

Rea, L. Operation for ptosis. Proc. Royal Soc. Med., Sec. on Ophth. A. J. O., 1922, v. 5, p. 138.

Smoira, J. Bell's phenomenon. Zeit. f. Augenh., 1922, v. 47, pp. 10-26.

Weekers and Colman. Recurring syphilis of lids. (2 ill.) Bull. de la Soc. Belge d'Opht., 1921, v. 44, p. 49.

Weinberg, E. Gangrene of lid due to diphtheria. Graefe's Arch. f. Ophth., 1921, v. 104, p. 345.

Wodak, E. Cochlear lid reflex. Monatsch. f. Ohr. u. Laryng.-Rhin., 1921, v. 55, pp. 591-592.

DISEASES OF THE ORBIT.

Achard, C., and Thiers, J. Asymmetric exophthalmic goiter. Soc. de Neur., Feb., 1922. Abst. Gaz. des Hôp., 1922, v. 95, p. 221.

Coulomb. Autoplastic ocular prothesis. Soc. d'Opht. de Paris, Jan., 1922. Ann. d'Ocul., 1922, v. 159, p. 154.

Howley, B. M. Monocular exophthalmos. Jour. Med. Soc., New Jersey, 1922, v. 19, pp. 77-79.

Lauret. Thrombophlebitis of cavernous sinus following dental infection. Paris Méd., 1921, v. 11, pp. 305-307.

Lunding-Smidt and Jensen, F. Posterior encephalocele of orbit. Arch. d'Opht., 1922, v. 39, pp. 108-114.

Moeller, P. Intracranial aneurysm of carotid. Klin. M. f. Augenh., 1921, v. 66, p. 909.

Suker, G. F. Leontiasis ossei. A. J. O., 1922, v. 5, p. 129.

INJURIES.

Bourgeois, A. Ocular wound from pen. Arch. d'Opht., 1922, v. 39, p. 115.

Connell, E. S. Perforating wounds of eyeball. Jour. Missouri State Med. Assn., 1922, v. 19, pp. 117-118.

Dorff, H. Late lesions following bee sting. Klin. M. f. Augenh., 1921, v. 67, p. 256.

Giraud, P. Intraocular foreign body. Radiographic localization, extraction after temporary luxation of globe. Soc. d'Opht. de Paris, Jan., 1922. Ann. d'Ocul., 1922, v. 159, p. 152.

Hennicke, C. R. Two intraocular pieces of iron with one entrance. Klin. M. f. Augenh., 1921, v. 67, p. 290.

Hess, C. v. Ophthalmologic observations upon Dresden railway accident. Zeit. f. Bahn. u. Bahnkass. 1921, v. 16, pp. 106-109.

Simpson, W. L. Foreign body in lens. (dis.) A. J. O., 1922, v. 5, p. 133.

Stanford, J. B. Injury to cornea. (dis.) A. J. O., 1922, v. 5, p. 134.

Stuelp, O. Lehmann's paper on death from ocular injury. Monat. f. Unfall. u. Inval., 1921, v. 28, pp. 158-161.

Repeated titles. **Denhaene.** (O. L., 1921, v. 17, p. 557). A. J. O., 1922, v. 5, p. 159.

TUMORS.

Gibson, J. L. Glioma of optic nerve. Med. Jour. Australia, Jan. 14, 1922, p. 38.

Ginsberg, S. Complete amaurosis following metastasis of bronchial carcinoma in both optic nerves. Klin. M. f. Augenh., 1921, v. 67, p. 232.

Green, J., Jr. Cystic tumors of caruncle. Southern Med. Jour., 1922, v. 15, p. 234.

Keys, M. J. Glioma retinae. (4 ill.) Trans. Pacific Coast Oto-Ophth. Soc., 1921, p. 95. Brit. Jour. Ophth., 1922, v. 6, pp. 110-118.

Lopez, C. J. Chavarria, A. P., and Ribon, V. Epithelioma of Conjunctiva. (3 ill.) Semana Méd., 1922, Jan. 26, p. 133.

Niosi, F. Cystic lymphangioma of orbit. (7 ill. bibl.) Arch. di Ottal., 1921, v. 28, pp. 219-246.

Poyales, F., and Munoz Urra, F. Epithelioma of cornea. (2 ill.) España Oft., 1922, v. 6, pp. 1-7.

Rea, L. Angioma of retina. Proc. Royal Soc. Med., Sec. on Ophth. A. J. O., 1922, v. 5, p. 138.

PARASITES.

Nunes. Ocular myiasis. (1 ill.) Ann. d'Ocul., 1922, v. 159, pp. 130-132.

GENERAL PATHOLOGY.

Eggston, A. A. Use of mercurochrome in pathologic and bacteriologic technic. J. A. M. A., 1922, v. 78, p. 509.

Hertwig, G. Ocular malformation experimentally produced in frog larvae. Anat. Anzeig., 1921, v. 54, pp. 94-100.

Igersheimer. Ocular changes due to toxin in diseases of choroid, retina and optic nerve. G. Thieme, Leipzig.

Michail, D. Eosinophilia of eye. Clujul Med., 1921, v. 2, p. 120.

Miescher. Genesis and nature of ocular pigment. Klin. Woch., Jan., 1922, v. 1, p. 173.

Neumann, H. O. Cell changes in dead cornea. (2 ill.) Virchow's Arch. f. path. Anat. u. Phys., 1922, v. 236, pp. 45-60.

Vogt, A. Sex linkage in heredity of eye defects. Schweiz. med. Woch., Jan. 26, 1922, pp. 77-84.

Wachs, H. Eye operations on amphibia larvae. Ges. Naturforsch. Freunde, Berlin, 1920, pp. 133-154.

Winge, O. Inheritance of ocular coloration partly of sex causation. Meddel. fra Carlsberg. Lab., 1921, v. 14, pp. 1-22.

Yamada, K. Autolytic products of eye. Japan Med. World, 1922, v. 2, p. 47.

Repeated titles. **Fleischer,** (O. L., 1921, v. 17, p. 272). J. A. M. A., 1922, v. 78, p. 759.

GENERAL DISEASES.

Aitken, C. J. H. Blindness following influenza. Brit. Med. Jour., Feb. 25, 1922, p. 311.

Brehmer, J. L. Headache from standpoint of oculist. Southwestern Med., 1922, v. 6, pp. 100-103.

Diaz Rodriguez. Ophthalmias dependent on endonasal affections. España Oft., Sept., 1921, v. 6, pp. 226-233.

Gough, E. F. Eye disturbances due to pelvic reflexes. Texas State Jour. Med., 1922, v. 17, p. 543.

Holstroem, R. Lethargic encephalitis. Hygiea, 1921, v. 83, pp. 213-231; pp. 241-263.

House, W. Neuropsychiatric views of disorders of eye, ear, nose and throat. (dis.) Pacific Coast Oto-Ophth. Soc., 1921, pp. 9-17.

Jenny, E. Mechanism of heart during pressure on eyeball. Zeit. f. d. g. exper. Med., 1921, v. 25, pp. 89-97.

Krambach, R. Permanent symptoms and amyostatic condition after encephalitis. Monat. f. Psychiat. u. Neurol., 1921, v. 50, pp. 189-201.

Kuepferle, L. Disturbances of internal secretions and relation to eye. Zent. f. d. g. Ophth. u. i. Grenz., 1922, v. 7, p. 1-8.

Lindgren, E. Eye in Basedow's disease. Trans. Dansk. Med. Selsk., 1921, p. 37.

Maucione, L. Ocular leprosy. (1 ill., 1 col., pl. bibl.) Arch. di Ottal., 1921, v. 28, p. 247

Mundt, G. H. Headache from standpoint of ophthalmology and oto-laryngology. Ill. Med. Jour., 1922, v. 41, pp. 183-86.

Munier, A. Epileptiform attack caused by testing oculocardiac reflex. Rev. Méd. de l'Est., 1921, v. 49, pp. 399-401.

Neame, H. Ocular tuberculosis (dis.) Proc. Royal Soc. Med., Sec. on Ophth. A. J. O., 1922, v. 5, p. 138.

Pirrazoli, A. Esophageal ocular reflex. Radiol. Med., 1921, v. 8, pp. 369-371.

Rist. Tuberculin in ocular tuberculosis. Arch. d'Opht., 1922, v. 39, pp. 49-53.

Sluder, G. Rhinologic experiences in ophthalmology. Southern Med. Jour., 1922, v. 15, p. 230.

Stuelp, W. Vitamins and avitaminoses with special reference to ophthalmology. Zent. f. d. g. Ophth. u. Grenz., 1921, v. 6, pp. 369-375.

Suker, G. F. Migrain patient; serous meningitis. A. J. O., 1922, v. 5, p. 129.

Weisser, E. A. Ophthalmologist's standpoint (diabetes). Penn. Med. Jour., 1922, v. 25, p. 381.

COMPARATIVE OPHTHALMOLOGY.

Billard, G., and Dodel, P. Eye and form of pupils in animals. Presse Méd., Jan. 25, 1922, p. 74.

Hertling, H. Extirpation and regeneration of eye in triton taeniatus. Arch. f. Entwick. d. Organ., 1921, v 49, p. 545.

Laurens, H., and Detwiler, S. R. Structure of retina of alligator Mississippiensis and its photochemic changes. Jour. Exper. Zool., 1921, v. 32, pp. 207-234.

HYGIENE.

Defective vision and industrial waste. Penn. Med. Jour., 1922, v. 25, p. 427.

Lighting in factories and workshops. Brit. Jour. Ophth., 1922, v. 6, pp. 78-80

McCord, C. P. Defective vision among industrial workers. J. A. M. A., 1922, v. 78, p. 606.

Purdy, J. S. Lighting and ventilation of factories. Jour. Indust. Hyg., 1922, v. 3, pp. 349-359.

Scalfati, D. Eye diseases and sanitary school service. Folia Med., 1921, v. 7, p. 500.

Weiss, E. Determination of color and permeability of eye glasses. Klin M. f. Augenh., 1921, v. 67, p. 159.

OPHTHALMIC SOCIOLOGY.

American specifications for motor headlights. Ill. Engineer, Oct., 1921. Abst. Brit. Jour. Ophth., 1922, v. 6, p. 80.

Boldini, A. Evaluation of incapacitation from visual loss. Rass. d. Previd. Soc., 1921, v. 8, pp. 35-44.

Harman, N. B. College for blind girls. Brit. Jour. Ophth., 1922, v. 6, p. 88.

Neher, E. M. Ocular manifestations of hysteria. Relation to compensation. (7 ill. dis.) Trans. Pacific Coast Oto-Ophth. Soc., 1921, pp. 19-36.

Taylor, S. J. Mercantile marine vision tests. Brit. Jour. Ophth., 1922, v. 6, p. 90.

Walker, C. H. Quackery in relation to diseases of eye. Bristol Med.-Chir. Jour., 1921, v. 38, pp. 129-142.

Würdemann, H. V. Industrial insurance and indemnity rules of governments. Trans. Pacific Oto-Ophth. Soc., 1921, p. 125.

EDUCATION, HISTORY AND INSTITUTIONS.

Greeff, R. Did lenses originate in China? Deut. opt. Woch., 1921, v. 7, pp. 899-900.

Jackson, E. The Washington Congress. A. J. O., 1922, v. 5, pp. 147-148.

Mueller, C. Original of Regensburg spectacle makers order. Zeit. f. ophth. Opt., 1921, v. 9, pp. 129-130.

Marquez. Memorial to M. Brisseau. España Oft., 1921, v. 6, pp. 221-226.

Passera, E. Knowledge of ophthalmology of Dante. Arch. di Storia della Sc., Dec., 1921.

Schweinitz, G. E. de. Ophthalmology in Peking. (1 ill.) A. J. O., 1922, v. 5, pp. 141-145.